CIVIL DEFENSE FOR NATIONAL SURVIVAL

(PART 1—Testimony of Dr. Willard F. Libby, Dr. Albert G. Hill, Dr. Lloyd V. Berkner, Willard Bascom, Dr. Merle A. Tuve, and Dr. James R. Killian, Jr.

HEARINGS

BEFORE A

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CIVIL DEFENSE FOR NATIONAL SURVIVAL

TUESDAY, JANUARY 31, 1956

HOUSE OF REPRESENTATIVES,
MILITARY OPERATIONS SUBCOMMITTEE,
COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met, pursuant to call, in room 1501, House Office Building, at 10:05 a. m., Hon. Chet Holifield (chairman of the subcommittee) presiding.

Members present: Representatives Holifield (presiding), Dawson, Kilgore, Griffiths, Riehlman, and Lipscomb.

Also present: Michael P. Balwan, staff director; Herbert Roback, director of investigations; and Carey Brewer, Legislative Reference Service, Library of Congress.

Mr. HOLIFIELD. The subcommittee will be in order.

The Military Operations Subcommittee today opens its hearings on civil defense. The hearing today is the beginning of what I expect will be many sessions with a great many informed and competent witnesses in both the broad area and the specific details of providing for an adequate civil-defense program for the United States.

There is a widespread belief in this country that civil defense is either futile against sudden massive assaults with nuclear weapons, or is hopelessly inadequate under present arrangements. Whichever is the case, the members of this subcommittee are convinced that it is about time that the people of this Nation are informed and an intelligent course of action formulated.

If it is futile to set up a civil-defense system, the people should know about it now and further expenditures should be curtailed. If civil defense offers a hope for the people of this country in terms of survival from bomb damage and in terms of adding an additional deterrent to attack upon us, then the people should be assured that adequate arrangements are being made for that purpose.

At this point, the subcommittee believes that effective civil-defense measures can be taken if the need for them is sufficiently understood by the public, if they are financially supported by the Congress and if they are courageously administered by the Executive.

It has long been my view that civil defense should be considered as an integral part of our national defense. So long as we live in the shadow of world conflict with atomic-hydrogen weapons, there is no alternative to strong national defense, including protective measures to reduce loss of life and suffering and to maintain the national economy in the event of enemy attack.

One might say that public apathy, congressional indifference, and bureaucratic inertia are the three great obstacles to effective civil

defense. Our subcommittee intends to take a fresh look at the problems to determine how these obstacles can be overcome.

Earlier in the 84th Congress, the members of this subcommittee decided that it was imperative that we look into the effectiveness of this Nation's civil-defense program. In January of 1955, I introduced House Joint Resolution 98, a bill to constitute the Federal Civil Defense Administration as an executive department, and for other purposes.

On March 31, 1955, my colleague and fellow member of this subcommittee, R. Walter Riehlman, introduced House Concurrent Resolution 108, designed to reconstitute the Federal Civil Defense Administration as an executive department within the Department of Defense.

Both of these bills were referred by the chairman of the Committee on Government Operations to this subcommittee for proper consideration.

Additional bills on this subject which were referred to this subcommittee were introduced by Congressmen Price and Rodino.

In this respect, this subcommittee is carrying out the specific legislative purpose of considering these bills on a completely nonpartisan basis.

Ever since the Joint Committee on Atomic Energy was formed, I have been a member of that body. From time to time I have observed experiments connected with nuclear-weapon development. I have personally witnessed tests and effects of atomic and hydrogen explosions. The spectacle of damage by large atomic and hydrogen weapons can scarcely be communicated from one person to another by word of mouth. That experience has impressed upon me more than anything else the great need for calling to the attention of theAmerican people the grim but compelling necessity for an adequate civil-defense program.

In the past 3 or 4 years, we have witnessed several attempts by various organizations or study groups to analyze civil-defense needs, in addition to that work already being done by the Federal Civil Defense Administration.

As early as 1952, under the sponsorship of the Department of Defense, the National Security Resources Board and the Federal Civil Defense Administration, a special study group conducted an intensive and comprehensive review of our continental defense and of the civil-defense program. It is known under the code name of Project East River.

The report of that group was published in 10 parts, 3 of which are still classified. Some of the recommendations of that group are being carried out. Less than a month ago, under a joint release of the Office of Defense Mobilization, the Department of Defense and the Federal Civil Defense Administration, the Nation received a report of the 1955 Review Committee of Project East River.

It was the purpose of this group to review the recommendations of the Project East River report in the light of subsequent developments and to determine where we stand today with respect to these recommendations.

I have read that report and find that it is highly critical of our ability to protect the people in the event of a nuclear attack on this Nation. It is startling to me that this report was received in a manner

of almost complete unconcern by the people of this Nation and by the Congress.

In 1955, the National Planning Association reported on a study of civil defense by a group of leading American citizens. This was an extensive appraisal of our civil-defense efforts which recommended a greatly strengthened Federal program with increased financial support and a higher and more effective degree of planning.

This report is entitled "The Tasks of Nonmilitary Defense and the Present Status of Planning," NPA Pamphlet No. 92, May 1955.

During this administration, concurrent with the operation of the Hoover Commission, of which I was a member, a Commission on Intergovernmental Relations also reported on civil defense. It is noteworthy that among the many governmental functions studied by that Commission, most of the recommendations called for further decentralization of various Government activities. Nothwithstanding that general approach it is significant that the Intergovernmental Relations Commission called for a greatly strengthened and more highly centralized civil-defense operation in the United States.

During the past 6 months, the staff of this subcommittee has spent the major portion of its time reviewing the various findings and reports on civil defense.

We have planned our subcommittee hearing program to study the problem of coordinating or possibly integrating our military and civilian defense efforts. This subcommittee will also inquire into the problem presented by the divided authority now existing among nonmilitary agencies having civil-defense functions.

It will also consider those special problems arising under emergency conditions as a result of the declaration of martial law. This, to me, appears to be a very confused area among the many problems related to civil defense.

This subcommittee plans to invite the Nation's leaders in science, military affairs, Government, both State and Federal, industry and labor to present their latest thinking on civil defense.

Later this week, the subcommittee has arranged to visit the Strategic Air Command at Omaha, Nebr., and the Continental Air Defense Command at Colorado Springs for comprehensive briefings on the Nation's military capabilities for preventing or overcoming the effects of surprise enemy attacks on civilian centers of population.

I hope it will be possible, also, for this subcommittee to hear the testimony of members of the Joint Chiefs of Staff on the plans which are in being, or in prospect, for coordinating military, air, and civilian efforts in the event of enemy attack.

We would like to have their views concerning the desirability of setting up a Federal civil-defense organization within the Department of Defense.

May I say at this point that the subcommittee is here to learn and not to lecture. Our inquiry is not motivated by politics. The problems are too grave. Their solution is too important to become the subject of political argument.

No administration, no party, can claim special competence in civil-defense matters today.

As our first witness this morning, we have the Honorable Willard Libby, Atomic Energy Commissioner, and a noted scientist in his own right.

Tomorrow this subcommittee plans to hear from Dr. A. G. Hill, formerly director of Lincoln Laboratories, Massachusetts Institute of Technology, and also a former member of East River study group.

Next week the subcommittee expects to hear testimony by Dr. John von Neumann, also an Atomic Energy Commissioner, and a noted and distinguished scientist as well. Dr. James Killian, president of Massachusetts Institute of Technology and a consultant on a variety of Government-sponsored scientific committees and associations, is expected to testify next week.

Others who will testify next week include Dr. Lloyd Berkner, president of Associated Universities, Inc.; Dr. Ralph Lapp, nuclear physicist and scientific author and lecturer; and Dr. Merle Tuve, chairman, department of terrestrial magnetism, Carnegie Institution of Washington, and chairman of the Civil Defense Advisory Committee of the National Academy of Sciences.

On behalf of the members of this committee, at this time I would like to welcome Dr. Libby to present his views. Dr. Libby, you have appeared before our Committee on Atomic Energy many, many times, and all of the members of that committee respect you very highly for your proficiency as a scientist, your frankness, and your ability to bring information to the Members of Congress.

It would be helpful this morning to have your testimony on weapons effects, on the manner in which the Nation might prepare to minimize the effects of strikes with these weapons, on the AEC role in advising the Federal Civil Defense Administration of recent and continuing developments as a result of AEC experiments, and on any other related matters which you deem important for these subcommittee members to hear.

STATEMENT OF DR. WILLARD F. LIBBY, COMMISSIONER, UNITED STATES ATOMIC ENERGY COMMISSION; ACCOMPANIED BY R. L. CORSBIE, DIVISION OF BIOLOGY AND MEDICINE; AND DR. CHARLES L. DUNHAM, DIRECTOR, DIVISION OF BIOLOGY AND MEDICINE

Dr. LIBBY. Mr. Chairman, I am happy to appear before you today to discuss these aspects, atomic weapons effects and the whole problem of civilian defense as far as the AEC is involved and can be helpful.

The Commission, in 1950, established a liaison branch with the Federal Civil Defense Agency, and the AEC and the FCDA have worked closely together on the technical aspects of an adequate civil-defense program since.

Commission assistance has taken a number of forms, furnishing classified information on weapons effects, declassification of large quantities of information and actual participation by FCDA in the tests of nuclear weapons both in Nevada and in the Pacific, and among other things, we have granted requests and other types of clearances for approximately 500 FCDA employees. We try to do what we can.

With the advent of formal nuclear weapons, our basic concepts of the requirements for civil defense have necessarily been modified. This is so because of the larger area of total destruction by weapons of higher yield, as well as because of the difference in the character, the fallout involved.

Surprisingly enough, however, the long-term fallout from the larger nuclear weapons is not as great as is commonly supposed. Perhaps some of the confusion which exists regarding the hazard from the fallout can be clarified if one recognizes that the radioactive debris comes from two main sources. One of these depends on the nature and type of weapons, and the other depends upon the conditions under which the weapon is fired.

Surface bursts involve the production of a heavy local fallout as opposed to those fired in the air or under the sea. High-yield bursts, according to evidence which we have gathered, place the major part of the bomb debris in the stratosphere, where it appears to stay for many years, slowly descending to the earth, and this has reduced the fallout hazard as compared to what it might otherwise have been.

Mr. HOLIFIELD. This presupposes the utilization of a bomb large enough to reach the stratosphere?

Dr. LIBBY. Yes, sir. This applies only to the very largest yield weapons, and as I will point out later in my prepared statement, the kiloton weapons rarely reach into the stratosphere.

Mr. HOLIFIELD. All right. Now, are you going to give your prepared statement verbatim? Are you making a preliminary statement now?

Dr. LIBBY. I was making a preliminary statement, Mr. Chairman, and I was about to go into the prepared statement.

Mr. HOLIFIELD. The reason, I didn't want to interrupt you until you finish, if that would be your wish. However, if you would like to stop on the points involved, why——

Dr. LIBBY. I had just as soon stop, sir, if you wish.

Mr. HOLIFIELD. Well, sometimes a statement, for instance, like you made just now, that a great deal of this material was carried into the stratosphere, might leave an impression on the press and on the public that there is only the one kind of A-bomb, and so, in order that that false impression not go out, I wanted to bring in two points at this time.

The first point is that you are speaking of a bomb of sufficient size that would puncture the stratosphere, and the second, that you are speaking of the type of bomb which was released in 1954, rather than types of bombs which could be made with more intense radioactivity.

Is that true?

Dr. LIBBY. It is approximately true, sir. There are factors which I think will be brought out in more detail in my statement which will clarify this.

Mr. HOLIFIELD. All right.

Dr. LIBBY. I would like to make two general points in my statement. The first on the facts about weapons effects, a brief statement of these, and the other is about the problems of civilian defense.

First, on the facts, atomic weapons possess great destructive power because they involve the sudden release of a large amount of energy in a small space—essentially a point, as compared with the volume of ordinary high explosive required for equivalent energy release. If we take the volume of TNT that would be equal to 10 megatons of explosive energy, as I calculate it, it is a cube 600 feet wide, 600 feet high, and 600 feet long.

So you see, an essential difference between atomic weapons and ordinary explosives is in the concentrated nature of the explosive energy.

This extremely concentrated and violently sudden release of energy is the source of the extraordinary and awesome blasts and heat effects of the atomic weapons.

The sources of the great energies released are the atomic nuclei partaking in two general types of reaction, the fission reaction and the fusion reaction.

In the fission reaction, the nuclei of the heaviest atoms, uranium and plutonium, are split into two principal fragments, with a release of about 20,000 tons of TNT equivalent of energy per kilogram of uranium or plutonium partaking in the reaction.

In the fusion reaction, the isotopes of hydrogen are combined to form ordinary helium in a reaction which is thought to supply the energy of the sun and, therefore, of course, is in an ultimate sense the source of most of our terrestrial energy on earth.

The fusion of a kilogram of deuterium, the heavy isotope of hydrogen, would be equivalent in energy to fission of several kilograms of uranium or plutonium. Both the fission and the fusion reactions occur by neutron change mechanisms. That means that neutrons are involved in the release.

Therefore, the explosions involve the release of large numbers of neutrons into the surrounding air or soil or water or whatever lies within a few hundred or a thousand yards of their distance at sea level will be irradiated.

In addition to the neutrons, a large amount of gamma radiations is released which is sufficiently penetrating and abundant as to constitute a hazard to personnel, although percentagewise most of the gamma rays are absorbed in the first few hundred yards of air.

Some of the gamma rays emitted during the fission explosion itself are absorbed in the fireball, and about an equal amount of radiation is emitted following the explosion from the fission products which are distributed throughout the fireball.

Now, these gamma rays, together with the neutrons, constitute what we know as the immediate or prompt radiation hazard. We see, therefore, that there are four kinds of effects: The blast, the thermal, the prompt radiation (consisting of these neutrons and gamma rays), and finally, the radioactive fallout.

Now, we take up first, the blast damage. With these essentials we can visualize the sequence of events in an atomic detonation and the concomitant threats to civilian life.

First a blinding flash of light is emitted from the point source, followed by the rapid development of a ball of fire which has a diameter dependent on the magnitude of the explosion and which might reach nearly 4 miles in the case of a 20-megaton weapon.

At the same time that the incandescent fireball develops and begins rising, the shock blast wave from the explosion itself proceeds outward at a speed somewhat greater than the velocity of sound, which is a fifth of a mile per second, and depending on the distance and the total yield of the explosion, pushes violently into structures and then later pulls them backward toward the point of detonation, as it has a double action—it pushes violently and then pulls back.

Now, this causes destruction of most structures out to distances of several miles. The blast shock itself lasts for some seconds; that is, the time interval between the outward sharp slamming thrust and the subsequent inward violent flow of air may be a matter of several seconds for the larger yield weapons.

Mr. HOLIFIELD. At that point, may I ask you this question?

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. If the bomb is exploded at ground contact, or at 1,000 feet, or 5,000 feet, or 10,000 feet, there would be a variance in all of those types of damage, would there not?

Dr. LIBBY. Yes; every one would differ in its aspects.

Mr. HOLIFIELD. Could you state at this time a general difference when, let us say, a bomb exploded at ground contact and one at, say, 5,000 feet?

Dr. LIBBY. Well, the first difference on the blast damage and the thermal—well, to take the blast first, since that is the one we have just briefly discussed, is that the distance away is changed, and I would say that is the principal effect on blast.

Now, of course, there will be complicated effects of reflection from the surface which I am afraid I am not able to describe in any particularly simple manner. Many of these weapons effects are set forth in our 5-year-old book the Effects of Atomic Weapons which is still the handbook on this subject.

We have a new edition in preparation which will be published soon. I don't know just when it will be available.

Do you know, Dr. Dunham?

Dr. DUNHAM. We hope within the current year.

Dr. LIBBY. We hope this will be out within the present year.

Mr. HOLIFIELD. That was written, as I believe, more than 5 years ago which, of course, was before the hydrogen weapon.

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. And so from a standpoint—it is obsolete as far as the consideration of blast, thermal and radiation damage is concerned.

The principles are there, but the principles have to be changed—I mean, the results have to be changed as a result of the new and bigger type bombs.

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. At this time, may I interrupt you to introduce the chairman of our full committee, Chairman Dawson.

Dr. LIBBY. How do you do, Mr. Dawson.

To proceed with the blast effect, a 10-megaton weapon at a distance of 18 miles would produce a blast wave consisting of a wall of air at 10-percent excess density of pressure. That is 1½ pounds per square inch above the normal pressure, and this thing would slam into structures traveling at a velocity of 1,100 feet a second, and arrive at the point 18 miles away about 1⅓ minutes after the explosion.

Now, that 1⅓ minutes is important. There is a very considerable time interval between the flash of light and the arrival of the blast.

Mr. HOLIFIELD. That is estimated on the basis of a bomb exploded at ground contact?

Dr. LIBBY. Essentially ground contact. These blast phenomena are not essentially dependent on the contact height except for the shielding effects and reflection effect.

Following the passage of the shock wave at this point 18 miles away, a 50-mile-an-hour wind would blow outward for a few seconds. After this the wind would stop and a gentler inward flowing wind would follow it.

The shock wave and accompanying dynamic pressure would take out all windows, do light damage to window frames, doors, moderate plaster damage, and generally wreck weak structures.

Mr. HOLIFIELD. That is at 18 miles distant?

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. And the degree of damage would increase in intensity as you went nearer to ground zero?

Dr. LIBBY. Yes, sir. Very much so.

In fact, to illustrate: At 12 miles distance, very severe damage would occur; whereas, the kiloton bomb used on Hiroshima created damage of this degree of severity up to a distance of 1½ miles, the distance with a 10-megaton weapon would be 12 miles.

Steel-frame buildings would suffer severe structural damage at between 9 and 10 miles, and reinforced concrete buildings with 10-inch walls and 6-inch floors would collapse at 3.2 miles.

In order to interpret this type of damage to buildings in terms of casualties to people, we estimate that for severe damage to 2-story brick structures, 85 percent of the people would be killed outright and the rest of them would receive sufficiently serious injury to require hospitalization.

In other words, for distances of 12 miles from ground zero for a 10-megaton weapon, casualty figures of this sort may be expected to apply to people at that time inside of such houses and structures, and at a distance of 3 miles, we may expect 100 percent casualties for people inside reinforced concrete buildings of normal 10-inch walls and 6-inch floors.

These damage figures are given in a table in this statement.

Air-blast damage to structures, based on Japanese experience

Damage	Distance from ground zero (miles) [1]		
	10 megatons	5 megatons	20 kilotons
Light damage to window frames and doors, moderate plaster damage, complete window damage	18.5	14.5	2.3
Moderate damage to homes. Severe fire damage expected. Flash ignition of dry, combustible materials	15.0	12.0	1.9
Severe damage to homes. Heavy damage to window frames and doors	12.0	9.5	1.5
Severe structural damage to steel-frame buildings	9.6	7.6	1.2
18-inch brick walls completely destroyed	6.4	5.1	.8
Collapse of reinforced concrete building, 10-inch walls, 6-inch floors	3.2	2.5	.4

[1] Estimated.

Now, we might turn to the second general type of fact, namely, the thermal damage.

The thermal radiation and the burning effects of atomic weapons are entirely due to the great radiating power of the hot fireball. The fireball develops to full size in the time of a few seconds, the rate and ultimate size depending greatly on the yield of the weapon.

For example, a 20-kiloton weapon would develop a fireball about 900 feet in diameter; whereas, the fireball of a 10-megaton weapon

would have a diameter of about 3 miles. These giant balls of incandescent gas rise like balloons because of the buoyant forces acting on the hot, low-density air.

The temperature of the fireball reaches a maximum of several thousand degrees at a time depending on the yield—several seconds for 10 megatons, and about a tenth of a second for 20 kilotons.

Now, following this maximum, the temperature falls, but the radiation continues for some time. Half of the total energy is emitted at about 6 seconds per 10-megaton weapon, while a 20-kiloton fireball has emitted half in about three-tenths of a second.

In other words, the thermal pulse is of much longer duration for the larger weapons than for kiloton weapons. This is a very important point, because again, the scale of events in the larger weapons is stretched out in time, and you do have some sort of chance to protect yourself; that is, in the case of blast, we had it arriving at 18 miles more than a minute after the flash, and now we have this flash—this thermal burning lasting for several seconds. So you have a real chance to do something in the way of protecting yourself.

The whole question of thermal or burn damage, therefore, depends in a complicated way on yield. Let's take third-degree burns on bare skin, as an example.

A 10-megaton weapon fired on the surface would be expected to produce these third-degree burns at distances on a clear day out to about 11 or 12 miles. For air bursts, almost twice as much energy will appear in the fireball as in the case of surface bursts, and third-degree burns would appear out to 15 miles.

Of course, factors of haziness, cloudiness, and so on, are important. It is clear, however, that for the large weapons, the thermal effect has a radius comparable to that of the severe blast damage on ordinary structures, and it is particularly large in the case of air bursts.

Now, here is a case, Mr. Chairman, of where the altitude and clouds and things of that sort are very important.

Mr. HOLIFIELD. The fireball exploding 5,000 feet in the air would produce less of an inverted funnel, or a greater inverted funnel of heat than if it exploded at ground contact?

Dr. LIBBY. I think it would produce more. You see, we expect roughly a factor of two. Now, it depends on the yield. If you had a fireball with a radius of 1½ miles, 7,500 feet, you would probably reach the maximum, I would imagine, at about 7,500 feet or a little bit more.

What would you say, Mr. Corsbie?

Mr. CORSBIE. I think that is about right.

Dr. LIBBY. That would probably be about the worst condition as far as thermal effects are concerned.

Mr. HOLIFIELD. And it would be safe to say that the degree of heat at a distance of 15 miles from ground zero would cause the burning of wooden structures?

Dr. LIBBY. Oh, yes.

Mr. HOLIFIELD. Immediately? I mean, they would burst into flame immediately?

Dr. LIBBY. Yes.

Mr. HOLIFIELD. At a distance of 15 miles?

Dr. LIBBY. I was speaking in terms of third-degree bare-skin burns.

Mr. HOLIFIELD. I understand.

Dr. LIBBY. That is the same thing, I believe.

Is that not so, that the calories for unit area on a third-degree skin burn are the same as ignition?

Mr. CORSBIE. For papers and things of that sort.

Dr. LIBBY. But it might not light heavy wooden beams?

Mr. CORSBIE. It might probably ignite them and it is also probable that some of them would be extinguished by the dynamic pressures, but that is uncertain as to what degree.

Mr. HOLIFIELD. But at least in an area, let us say, 7 or 8 miles in radius, you would have spontaneous fire explosions in all inflammable structures?

Mr. CORSBIE. I think that is correct, sir.

Mr. HOLIFIELD. And if that did occur, you would have what would be known as a condition of a fire storm and a consequent inrush of heat and a pillar of uprising heat coming in from that area or wider, which would create somewhat of a storm in itself; would it not?

Mr. CORSBIE. That would be possible, Mr. Chairman; whether or not you had the fire storm would be dependent on the amount of ignitable material.

Mr. HOLIFIELD. But in our average cities, we do have a tremendous amount of ignitable material as we find out when a block of houses, for instance, become involved in a fire. When one house fire spreads to several houses within a block of a city.

Now, visualizing the same effect over a large city of a million or two million people, you would certainly have enough inflammable structures and inflammable materials outside of and inside structures that you would have a tremendous fire storm; would you not?

Mr. CORSBIE. I think that is correct.

Mr. HOLIFIELD. For the benefit of the record, the gentleman's name who responded is what?

Mr. CORSBIE. I am R. L. Corsbie. I am with the Division of Biology and Medicine.

Mr. HOLIFIELD. You agree with that, of course?

Dr. LIBBY. Yes; I certainly do.

In fact, in the next paragraph of my statement that point is made.

Mr. HOLIFIELD. Of course, within that area, to make it a practical application, would exist our fire stations, many of our central fire stations. And their equipment would be either destroyed or immobilized within that radius of 7 or 8 miles. Is that not true?

Dr. LIBBY. Yes. Maybe larger, depending on the yield of the weapon.

Mr. HOLIFIELD. Yes; we are speaking now of a 10-megaton weapon.

Dr. LIBBY. If you take that, I would think it would be even a larger radius. It would depend on conditions.

Mr. HOLIFIELD. And we are talking about the wind currents that would be created by the fire phenomenon itself and not an existing strong current of wind which might be in existence at that time, which would increase the fire hazard tremendously if that were so.

Dr. LIBBY. I think we might by way of illustration recall the firestorm that occurred at Hiroshima. It took about 20 minutes for it to develop. And then the winds blew inward at velocities between 20 and 40 miles at all directions inward to the city. And this went on until the city was burned up. The combustible material was exhausted.

Mr. HOLIFIELD. Now, that was a 20,000-ton TNT equivalent bomb. Do we have information on these higher yield bombs as to whether the inrushing wind currents are stronger than 30 or 40 miles an hour?

Dr. LIBBY. Well, I think it would depend entirely on the local conditions and on the amount of combustible material in the area. And I really don't know the answer to that question.

I would think that 30 or 40 miles an hour would take care of it, because you have a much larger periphery in these bigger bombs.

Mr. HOLIFIELD. I didn't know but whether the ensuing updraft of thermal flow would cause a greater suction on the surrounding atmosphere.

Dr. LIBBY. It might. I am sorry, I just don't know the answer to that question.

Do you know it, Mr. Corsbie?

Mr. CORSBIE. You would have a much larger area. And it is possible that your higher wind velocities would take place closer to ground zero. But I think referring again to the Hiroshima experience in a city of 27 square miles approximately four and four-tenths were completely burned out.

Now, in that case, the extent of the firestorm was determined by the inflow of the hot gases and the ascending column. So, I think over the principal part of the area, your velocities would be about the same. In close they might be greater.

Mr. HOLIFIELD. My question was predicated on the fact that 20,000 tons of TNT makes quite a different explosion from 10 millon tons, or 20 million tons of explosive force.

Mr. CORSBIE. Yes, sir.

Mr. HOLIFIELD. I think it would be reasonable to suppose that there would be a greater suction, a greater fire column. And, therefore, a greater suction, which would in turn produce a higher velocity wind current.

Mr. CORSBIE. Yes, sir.

Mr. HOLIFIELD. I think that is a reasonable supposition.

Mr. CORSBIE. Yes, sir.

Dr. LIBBY. We have also seen firestorms, of course, in the case of large forest fires and also during World War II in Europe in some of the large bombings.

Well, now, we might pass to the third general weapon effect, the initial nuclear radiation damage:

The explosion is accompanied by the emission of neutrons and gamma rays as previously mentioned. The neutrons and some of the gamma rays are emitted in the actual explosion, but the main portion of the effective gamma radiation is liberated subsequently as the short-lived fission products decay in the first minute or two.

Mr. HOLIFIELD. Now, for the purposes of the lay readers of this record, Doctor Libby, will you explain the penetrating power of neutrons and gamma rays and the extent of shielding which is necessary in our atomic plants to protect our workers from such contamination?

Dr. LIBBY. Yes.

Well, to take neutrons first: They are very penetrating of their nature. They will go through a foot of concrete without much trouble. However, a foot of water has a power of stopping them much better. It is their nature that materials that contain hydrogen such as water or

gasoline stop the neutrons. But a yard of concrete will do a fair job on neutrons.

Now, gamma rays are stopped nearly completely by a yard of concrete. As a matter of fact, a foot of concrete is pretty good protection for gamma rays. In air they travel a matter of a hundred or 200 yards before they are reduced to, say, half their intensity. And you will have to go a thousand yards to get any real protection from them.

Mr. HOLIFIELD. Now, would that apply with equal effect on people above ground or below ground?

In other words, is the flow horizontal or would it penetrate basements?

Dr. LIBBY. Well, the radiation is emitted in a straight line, similar to light. However, the neutrons and gamma rays will penetrate things that the light will not, of course. And, so, the only protection from this prompt radiation is shielding or else distance—one or the other. You can either be far away or you can be behind something.

Mr. HOLIFIELD. Well, a person in a cellar, for instance, a thousand yards away would be in a much more protected position than a man in the first floor or second floor of a house?

Dr. LIBBY. If he had a good yard of earth between him and the point at which the bomb is fired.

Mr. HOLIFIELD. I am speaking of a man that would be in a cellar on a level piece of ground and a thousand yards from ground zero. Would the gamma and neutrons flow horizontal with the surface of the earth, or would they go over and go into the cellar?

Dr. LIBBY. They travel generally in straight lines.

Mr. HOLIFIELD. So from a practical standpoint, he would be in a much better position, particularly if he were covered with a yard of earth or a yard of concrete or some other thick substance?

So that would lead you to say, then, that there is a safety factor in underground shelters which does not exist in above-ground shelters?

Dr. LIBBY. Well, also the above-ground shelters, if the walls are thick enough.

Mr. HOLIFIELD. Yes. But the average home, of course, does not have thick enough walls.

Dr. LIBBY. That is right.

Mr. HOLIFIELD. We are thinking now in terms of 75 million people who live above ground in our large concentrated cities in ordinary structures.

This committee is interested in the civil-defense factors applying to people at this instance.

Dr. LIBBY. Yes.

For example, at 3,000 feet from a 20-kiloton bomb, this radiation, this prompt neutron and gamma ray which comes out in the explosion, would probably prove fatal to 50 percent of human beings if protected by 12 inches of concrete.

Mr. HOLIFIELD. If protected by that?

Dr. LIBBY. Yes.

However, 2 feet of concrete would reduce these fatalities to a very low figure, because this would cut the radiation dosage down to about 40 roentgens, which is about—Dr. Dunham, what is the mean lethal dose?

Dr. DUNHAM. For immediate prompt radiation it is around 400 to 450 roentgens.

Mr. HOLIFIELD. Now, that is an immediate explosion of 400 to 500 roentgens?

Dr. LIBBY. Yes.

Mr. HOLIFIELD. But roentgens are also accumulative, are they not?

In other words, if a person gets the same amount in a year's exposure to contaminated objects, it would be equally lethal, would it not?

Dr. Dunham, will you identify yourself for the record.

Dr. DUNHAM. Dr. Charles L. Dunham, Director of the Division of Biology and Medicine, Atomic Energy Commission.

Mr. HOLIFIELD. Thank you.

Dr. DUNHAM. No. When the doses are received in small increments, there is a reparative process that takes place in the body, so that the lethal dose from accumulated small doses is considerably higher than that from a single large dose.

Mr. HOLIFIELD. In other words, you would stretch out the 400 maybe to 600 or 700.

Dr. DUNHAM. It might go higher than that, depending on the age at which it was received.

Mr. HOLIFIELD. So the evacuation of an area, a contaminated area, would be a matter of tremendous importance in case there was a radiation hazard say of from 10 to 25 roentgens per hour.

Dr. DUNHAM. Yes, sir.

Mr. HOLIFIELD. It would be possible for a great percentage of the people to survive if they were either shielded to the point where they only absorbed, let us say, 100 roentgens in a day; there would be damage done to the human body; but there could be survival if they were either shielded to prevent getting more than that or if they could in the process of evacuating a contaminated area be only exposed to that much?

Dr. DUNHAM. That is right.

Mr. HOLIFIELD. So that gives some hope to the people for prompt and efficient evacuation, if it can be arranged physically.

Dr. DUNHAM. Yes.

Dr. LIBBY. We have a sort of general rule that 1 mile of air will attenuate these radiations. We can say that beyond one mile the nuclear radiations—these prompt ones—would be virtually harmless, because of the air absorption.

Now, this is a very important point because this means that the instantaneous nuclear radiations from large weapons are relatively harmless. They are so overshadowed by the seriousness of the blast and the thermal.

Mr. HOLIFIELD. Well, they are only harmless in a relative way?

Dr. LIBBY. Yes.

Mr. HOLIFIELD. If you got a dose of 5,000 roentgens in a second, in the second of explosion, of course you would be gone anyway?

If you got over 500 roentgens in the actual explosion time, you would be in a bad way?

Dr. LIBBY. The point in making that statement, Mr. Chairman, was to point out that the effects which are dominant here—this is not one of the effects. You will have to protect against other effects which would have gotten you anyway. That is, if you were within a mile of that fireball, which you would have to be in order to get these

effects, something else would probably get you. And this is important, I think, in making civilian defense plans.

Mr. HOLIFIELD. Yes.

Dr. LIBBY. In regard to the blast: the megaton weapons had a difference from the kiloton wave in that the blast wave arrived at a later time.

Now, this was purely because of the larger scale of the weapon; because if you were in the peripheral regions of damage, almost a minute would elapse between the flash of light and the time the blast hit you. So, you really have some difference here.

Now, of course, in the case of kilotons, it is several seconds. So, you can do the same thing. But the time is much longer with megaton weapons.

With regard to the area of thermal damage, we have the same kind of thing; that is, the longer time scale of the phenomenon. So, you have a chance to get behind shelter, and so on.

And, now we see here in nuclear instantaneous radiation a qualitative difference when a megaton is compared with a kiloton weapon, because I think it is important to bear these differences in mind, because the defense against them can be quite different.

Now, the last of the weapons effects is the radioactive fallout.

The radioactive fallout is radioactivity which comes out, or falls out, of the atmosphere after the explosion of a nuclear weapon. In the ordinary atomic bomb, for example, which gives 20,000 tons of TNT equivalent of explosive energy, there are about 2 pounds of radioactive materials. And in these 2 pounds, there are some 90 different radioactive species varying in lifetime from a fraction of a second to many years. I think the longest one of any importance is 33 years.

Mr. HOLIFIELD. In order that the laymen may understand that: the 2 pounds of radioactive material can be spread in the dust?

Dr. LIBBY. Yes.

Mr. HOLIFIELD. To the point where we ordinarily think of 2 pounds as being an insignificant amount, it becomes from a lethal standpoint a tremendous factor over a large number of square miles; is that not true?

Dr. LIBBY. That is true, sir.

Now, this mixture of radioactivity loses its radioactivity rather rapidly. The general rule is this: it loses tenfold every sevenfold increase in age. So, if you had a fallout which occurred 7 hours after the bomb was fired, the radioactivity in the fallout would be one-tenth of what it was at 1 hour. If it were 2 days, that is 48 hours, which is roughly 49, it would be 1 percent of what was at 1 hour; and at 2 weeks, which is another factor of 7, it would be down to 1/1000. This is a rough rule.

The radioactivity decreases pretty rapidly. That is why it is so important if we can keep this stuff away from us for the first few days or weeks.

Mr. HOLIFIELD. That is a very important matter for civil defense people to know. And it is also important from the standpoint of assuming that your ground zero explosion would occur in the center of an industrial or military target?

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. And then it would also be tremendously important to the people to know the prevailing wind at that time, because that would carry the radioactivity at a certain rate of speed downwind and spread out in a fan shape, more or less.

It would be possible to vary your defense structures as you receded from the zero point of explosion. In other words, you would need thicker walls, heavier subterranean chambers in case you did have that type of defense, closer to it, and as you got further out, they could be of a more modest type of structure and less costly.

Dr. LIBBY. Yes, I would hope so.

Mr. HOLIFIELD. Are the winds in most of our cities of such a prevailing nature that the general area of possible hazard can be pretty well charted, or do they vary with different seasons of the year to the point where you would have to consider almost every direction from the center of a large city like Washington or Detroit or Chicago?

Dr. LIBBY. They certainly vary a lot, but there is a prevailing wind in a large part of the cities of our country.

Mr. HOLIFIELD. For instance, in Chicago, I imagine the prevailing wind would come off of Lake Michigan toward the city.

Dr. LIBBY. Yes, it does. It varies quite a lot, though. Would you comment on this, Dr. Dunham?

Dr. DUNHAM. I think Chicago's prevailing winds are from the west and southwest. Occasionally you get a local wind off the lake, but it isn't the wind that would be carrying the fallout, probably.

Mr. HOLIFIELD. I see. Now, doesn't this bring up the point that an accurate weather forecasting and an accurate knowledge of prevailing wind currents at different times of the year, for the purpose of either preparing shelters or for the purpose of evacuation, is a tremendously important factor?

Dr. LIBBY. Yes. Would you like to enlarge on this matter, Mr. Corsbie, a bit?

Mr. CORSBIE. Yes, sir. Confirming the chairman's remark, that it is of the utmost importance that you have good weather data, that is, the weather structure up to 50,000 feet or above, in order to alert a civil defense plan, depending upon the warning you have, which would dictate the evacuation routes, assuming that more than one was available, in order that you would evacuate in the least hazardous direction.

Without this, it is possible, of course, for evacuation to be hazardous in itself.

Mr. HOLIFIELD. Right in the path of the fallout?

Mr. CORSBIE. Yes, sir; without this, that is correct.

Dr. DUNHAM. Mr. Chairman, I think it is important to realize that Mr. Corsbie was saying you must know it at the time.

Mr. HOLIFIELD. That is right.

Dr. DUNHAM. That you can't bank on prevailing winds at all.

Mr. HOLIFIELD. That is right. And, of course, if we are going to have, then, protection for the people, this is one of the very important things that has to be taken into consideration in any possible target area.

Dr. LIBBY. Now, the conditions of fallout are largely determined by the amount and type of material that goes into the fireball, that is vaporized into the fireball of the bomb itself.

A bomb that is fired in the air has such a small amount of matter that the particles found after dissipation of the enormous energy released are of necessity very small, and therefore, very slow in settling.

That is the first point, that air blasts constitute the least hazard, as far as local dense fallout is concerned. Because of the slow setting, the radioactivity decreases while it is in the air and before the fallout occurs, and the fallout area is increased. In fact, it goes to the ends of the earth in minutes, although detectable amounts.

As I was saying, the length of time the fallout remains in the air depends very much on whether it punches through into the stratosphere or does not.

Mr. HOLIFIELD. At this point, Dr. Libby, I am going to ask you a question, and in any of the questions, of course, that I ask you, you are aware of your security obligations.

Would you care at this time to comment on the fact that certain substances can be impregnated in the bomb or possibly coating the bomb which would increase or decrease radioactivity?

Dr. LIBBY. Well, I have some comments later in my statement.

Mr. HOLIFIELD. All right. I will withhold that.

Dr. LIBBY. I have some comments that bear on this point, sir.

Mr. HOLIFIELD. All right.

Dr. LIBBY. A bomb that is fired on the surface of the earth may have an appreciable portion of its radioactivity reprecipitated within relatively short distances, while, of course, bombs fired beneath the surface of the earth may place, if they are deep enough, essentially no fallout radioactivity in the atmosphere.

It depends on the degree and the soil, the water, whatever covers it. Therefore, the question of the area of contamination to be expected from nuclear weapons cannot be answered categorically without specifying many things: The degree of contact of the fireball with the surface, and probably also the nature of the surface. Water will differ considerably from soil. The coral in the Southern Pacific islands used for the larger United States weapons tests will, under the great heat, decompose to form calcium oxide which later will pick up water to form slaked lime, and this eventually will pick up carbon dioxide in the air to form calcium carbonate.

Mr. HOLIFIELD. Would this be pertinent, to say that the box of soda on the housewife's shelf would probably be the hottest radioactive substance in the house?

Dr. LIBBY. Well, the chemical is similar, but I hope it wouldn't be radioactive.

We, therefore, see that the fallout particles from the great tests at Eniwetok differ from what would be observed if the same weapons had been fired over ordinary sand or granite rock. We can't imagine all of the details in which the nature of the soil would affect the local fallout, but it is clear that the effects would be substantial, and we need to know more about this.

Now, in the weapon tests operation, great care is taken to insure that no danger results from fallout. Criteria are used which are meant to insure this. However, it is well to realize that it is from the test operations themselves that we have learned what we do know about the problem of civilian defense against fallout.

We speak of test experience which is the only source of experimental information about the phenomena of radioactive fallout.

Mr. HOLIFIELD. And is it pertinent to say at that point that one of the main reasons for continuing our tests of these weapons is to further explore areas which have not been explored on previous tests for the benefit of shielding our populations?

Dr. LIBBY. Well, this certainly is one of the benefits from testing.

Mr. HOLIFIELD. The tests in the future will all have value from that standpoint, will they not?

Dr. LIBBY. We take advantage of every opportunity we can to learn more about critical questions involved.

Now, in more detail, the mechanism by which the fallout radioactivity produced in nuclear weapons descends. The first point is that from the point of view of fallout, there are two essential classes of weapons, the high-yield megaton weapons, and the lower-yield kiloton weapons.

Just as in the case of the other three effects, we see that there is a difference. All nuclear weapons produce atomic clouds which rise to heights dependent upon the energy released. Now, of course, the height to which they rise depends also on whether they are buried underground or fired on the surface or in the air, but the yield has a large effect.

The clouds from the megaton class of weapons rise rapidly up through the tropopause and pass into the top layer of the atmosphere which we know as the stratosphere. This part of the atmosphere is essentially isolated from the layer in which we live, the troposphere, and where all our normal winds and storms and weather phenomena occur; that is, rain, for example, and snow, and this kind of thing is a tropospheric phenomenon.

Therefore, the radioactivity produced in megaton weapons, particularly in an air burst, is placed largely immediately in the stratosphere, as I shall describe a little bit later, while the smaller kiloton weapons produce clouds which, in general, do not reach into the stratosphere, but stop near the top of the tropopause—the boundary between the stratosphere and the troposphere.

As a result, they have the bulk of their radioactivity left in the lower layer of the atmosphere—the troposphere.

Mr. HOLIFIELD. But is it not true, now, in order that this record be clear, that in the case of the contamination of the people on the Lucky Dragon, which was some eighty-odd-miles away from the ground zero burst, that we were dealing there with a megaton and not with a kiloton weapon?

Dr. LIBBY. Oh, yes, sir.

Mr. HOLIFIELD. And the megaton weapon still leaves enough radioactivity in the tropopause that we cannot say that it is not a tremendously dangerous radioactive weapon?

Dr. LIBBY. Oh, no, I wouldn't want to imply that.

Mr. HOLIFIELD. I thought I would bring out that point, because otherwise, it might be thought that the big weapons did not leave enough radioactivity in the tropopause to make them tremendously deadly in a radioactive sense.

Dr. LIBBY. You are correct.

No, it is a fraction of it, which is left downstairs, but this fraction is very dangerous.

Mr. HOLIFIELD. Yes.

Dr. LIBBY. Now, the radioactivity, the fallout which is left in the troposphere where rain occurs, is washed down in the matter of days or weeks. We know, for example, that a 10th of an inch of ordinary rain will remove most atomic matter in the air except for the very smallest material.

In other words, for a 10th of an inch of rainfall, it would be quite certain that the area between the air and the ground would be washed essentially clear of fallout material.

Mr. HOLIFIELD. But that material would then be deposited on the earth?

Dr. LIBBY. Yes, sir. In the raindrops.

Now, there may be a minute fraction which might get out of the way of the raindrops as the air gets out of the way, but this tiniest fraction is likely also to be precipitated because it migrates around, being so small, and it may attach itself to other dust particles, and so it would be rained out itself.

For these reasons, tropospheric radioactive fallout doesn't stay in the atmosphere for more than a matter of weeks, at the outside. It may make 2 or 3 trips around the earth and because of the short time, it doesn't have much chance to move out of the latitude in which it originated, so it will be deposited in the same general latitude.

Mr. HOLIFIELD. And it is possible to pick up on delicate instruments those trips around the earth a second and third time?

Dr. LIBBY. Yes, sir. Of course, it decreases very rapidly due to the increased age of the material and the fact that it falls out as it goes around.

Mr. HOLIFIELD. Of course, this is one of the basic scientific reasons why we can pick up explosions in other countries and know when they occur and estimate as to what type explosions they are?

Dr. LIBBY. Yes, sir. Atomic weapons fired in the air can be picked up by fallout.

Mr. HOLIFIELD. Yes.

Dr. LIBBY. Now, this is in very sharp contrast to the fallout material which is placed in the stratosphere which appears to stay there for a matter of years. We don't have very good figures for this, but it looks like 10 years might be a pretty good average.

We must bear in mind, however, that this is based on the nature of the material carried up in the clouds that we have had to work with, but our present experience indicates that the fallout from these large weapons which does not occur immediately—that is, the material which falls out immediately within the first few hundred miles is not the material which generally goes into the stratosphere, though big lumps may be thrown into the stratosphere and fall right back down.

The fraction which falls out locally is on large particles. The fraction which does not fall out quickly and goes into the stratosphere is deposited at a very slow rate corresponding, perhaps, to an average time in the stratosphere of about 10 years.

As a result of this long residence time in the highest layers of the atmosphere, the winds mix and distribute the radioactive material broadly over the earth and one finds when the fallout does finally find its way down into the troposphere and come down to the earth, that its rates of precipitation are relatively uniform.

There is a banding around the middle where the firing occurred which confined it even in the South Pole. Thus, we see that the local

fallout hazard is entirely due to the fireball touching the ground, and in the case of the larger yield weapons in the megaton range can constitute a phenomenon of terrifying proportions, as you pointed out a moment ago, Mr. Chairman.

Nevertheless, it is the small though very significant fraction of the total radioactivity. Nothing I have said this morning should be interpreted as minimizing this threat.

We conduct our weapons tests with great attention to this and the other dangers and every effort is made to protect against misadventure. However, some of the tests must be conducted under conditions where the fireball does touch the ground and some local fallout does occur.

The larger weapons are invariably tested at Einewetok to minimize any hazard. Just to recall to mind, the total radioactivity exposure of people in the United States, whether because of the closeness to the Nevada test site, have received more than average exposure by perhaps a factor of three, is about 0.1 roentgens.

There were, however, a small group of persons who received a maximum of about 4 roentgens. The average background dosage due to natural causes to persons in the United States is approximately 0.150 roentgens per year.

I would like to ask your permission, Mr. Chairman, to introduce into the record a paper on the natural background dosage which was published last July, if you don't mind. It describes the exposure people received from granite rock and cosmic rays from their own bodies, and these various natural things—wristwatches, and things like that. It gives you a notion of the relative magnitude of the radiation exposures from test fallouts and from ordinary circumstances.

Mr. HOLIFIELD. I will be glad to receive that information, and at this time let me ask you what would be the exposure of an individual taking an X-ray; how many roentgens?

Dr. LIBBY. I would like to ask Dr. Dunham to answer that question.

Would you give your guess or estimate of the average body exposure for a person taking an X-ray?

Dr. DUNHAM. It depends upon the type of X-ray. Now, a chest X-ray is a matter of a fraction of a roentgen to the chest, with relatively small exposure to the rest of the body.

Mr. HOLIFIELD. Then 4 roentgens mentioned here would be quite a bit more than you would get in an X-ray?

Dr. DUNHAM. On the other hand, with a fluoroscopic examination of the stomach and gastrointestinal tract, you may get as much as 30 or 40 roentgens to the part of the body examined.

Mr. HOLIFIELD. Well, that is why I wanted to bring this point out, so that the people could have assurance in the United States that the exposures that they have received as a result of these tests, even in those isolated cases where a small group of persons received the maximum of exposure that occurred, was not a matter of danger to their bodies.

Dr. DUNHAM. That is right.

Mr. HOLIFIELD. Because there have been many of us Congressmen who have had any number of letters protesting these tests and because of the danger of this sort of thing, I think it well that we clear

this point up here from the highest source that we can receive it from, which is you gentlemen who are charged with the responsibility under law of protecting the American people from just this sort of thing.

Dr. LIBBY. Well, therefore, we see that high-yield weapons fired near the surface have a portion of their activity deposited on particles large enough to fall out in the first few hours or days.

This makes three kinds of fallout from megaton weapons. The first or local fallout which is due to large-sized particles may cover a very considerable area. On February 15, last year, the Atomic Energy Commission revised a document which described the experience in the Marshall Islands in the Castle test series in the spring of 1954 for some 7,000 square miles downwind described as being contaminated by this type of local fallout.

Now, the second type of fallout——

Mr. HOLIFIELD. Will you complete that sentence, please, for the benefit of us: "which would be hazardous for long-term unprotected occupancy."

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. Thank you.

Dr. LIBBY. The second type of fallout from these high-yield weapons is that portion which resides in the small particles, which never reaches the stratosphere, stays in the lower layer of the atmosphere, and is carried down by rainfall or settles out, and this stuff may make trips around the world, but it eventually comes out in a matter of a few weeks at most in the general latitude where the bombs were fired.

However, a large part, half or more, depending upon firing conditions, a large part of the radioactive yield from high-yield weapons resides in the third category, which is the fallout which occurs from the stratosphere itself.

Of course, some of the large local fallout may be in big particles which are lifted into the stratosphere which drop right back. This finely divided material which reaches the stratosphere apparently stays there for years, and the slow leakage through the tropopause occurs with apparently something like roughly 10 percent per year descending.

We thus see that this is a very slow process. This is very fortunate, indeed, since the high-yield weapons thus have a major part of their radioactivity dissipated in the atmosphere in a harmless way if they are fired in the air or on the surface.

The fallout apparently occurs in the final step by washing down of the tropospheric air by rain, as well as by direct falling. The radioactivity descends from this stratosphere into the troposphere by the processes of diffusion and falling and is then caught up by the weather and in a matter of a few days is deposited.

Reasonable estimates for the middle latitudes gives an average time in the troposphere of perhaps a week; after it gets down through into the troposphere, it may be a week before it comes down.

Mr. HOLIFIELD. It might be well to point out at this time that complete dispersal of all of the radioactivity in the troposphere could be attained by not increasing the size of the bomb to the point where it punctured the stratosphere and dissipated the majority in the stratosphere?

Dr. LIBBY. Yes. It would be possible to maximize the fallout danger if one wanted to.

Mr. HOLIFIELD. Thank you. Proceed.

Dr. LIBBY. Now, the radioactivity resulting from the bursting of nuclear weapons are two kinds, those we have been speaking of and the radioactivity induced in the environs.

Now, the environ can be made radioactive by neutrons which are produced in large numbers as we said earlier and some of these are certain to escape from the bomb into the surroundings.

We take air bursts first: The problem is what do neutrons do to air? The answer is a very simple one. They make one radioactivity which fortunately has a half life of 5,600 years, very long. That is C–14. Now, this radioactivity is essentially safe; that is, we take an air burst, the neutrons which get out of it and activate the air make this long-lived radioactivity which is essentially safe because of its long lifetime and the enormous amount of diluted carbon dioxide that is already present in the atmosphere.

As you know, the carbon dioxide is the source of the carbon in plants. The cosmic rays which bombard the earth make neutrons and they make radiocarbon, and by studying this, we can make the nature of this hazard of activation of the atmosphere.

In fact, the earth has already on its surface a total of about 80 tons of radiocarbon made from the cosmic rays, and of this 80 tons, there are about 1.2 tons in the air at any given time.

Now, it takes one neutron to make each radiocarbon atom. So we see that this corresponds to over 5 tons of neutrons, and this enormous number of neutrons would have to be produced and escape from the bomb in order that nuclear weapons would just double the feeble natural radioactivity of living matter due to radiocarbon.

Such an increase would have no significance as far as we know from the standpoint of health. To orient ourselves, the 20-kiloton bomb involves the liberation of 10 grams of neutrons; that is, 1/100th of a ton. If all of these neutrons, if all of them got out of the bomb, which they can't, or the bomb wouldn't fire if they did, if all these neutrons escaped, it would take 7,800 of these 20-kiloton weapons to double the radiocarbon content of the atmosphere, even if it all stayed in the atmosphere and didn't go into the ocean where most of the radiocarbon naturally present resides.

Mr. HOLIFIELD. This is assuming, of course, universal dispersal of that amount and not concentration in one area.

Dr. LIBBY. That is right. It would take 520,000 of them if the mixing were complete with the sea.

Now, these correspond to explosive energies of 156 megatons and 10,400 megatons, respectively, if all the neutrons escaped.

It is reasonable to assume that only a small fraction of the neutrons escape, and the bomb couldn't fire if any large fraction did. And therefore the probable number of megatons of fission necessary to just double the atmospheric radiocarbon would be much higher.

In addition to carbon–14 there are a few other radioactivities produced by bombs fired in the air; neutrons from bombs fired in the air, radiating the air. They include tritium with a twelve-and-a-half year life and very short-lived products, but all of them like carbon–14 are produced in amounts that are not hazardous.

So we return to the question of the—we will have one more question: Now, if the bomb is fired on the surface—and this comes to the point

you were raising earlier, Mr. Chairman—if the bomb is fired on the surface you worry about the activation of the surface material; say, the rocks and the water, and whatever is around the bomb, by the neutrons. This is a possibility, but the first point is, in general, most of the neutrons do not form radioactive isotopes, but stable isotopes, in these materials. The amount of radioactivity produced at least with ordinary surface materials is relatively small.

The principal radioactivities are produced by nuclear weapons themselves and not in the surroundings.

Now, returning again to the material which is produced in the weapons themselves.

Mr. HOLIFIELD. Before we leave that point. In order to clarify that point: when the 1954 weapon was exploded over the islands in the Pacific, it dug a hole something like a hundred and sixty-five feet in the center and a mile across, and it was estimated, I think, that 400 million tons of coral was scooped out of that cavity and transformed into dust; and that did become radioactive, did it not?

Dr. LIBBY. It became radioactive in the main by assimilation of the radioactivity generated in the weapon.

Mr. HOLIFIELD. That is right.

Dr. LIBBY. It had some radioactivity induced in it from the neutrons; but the dominant major fraction was the material that stuck to the particles which was produced in the weapons.

Mr. HOLIFIELD. That is right, and so if you do have an explosion of a 10- or 20-megaton variety, the ensuing dust that is sucked into this uprising column of thermal units will become radioactive and will constitute the hazard, even though they are something in addition to the material of the bomb.

Mr. LIBBY. That is right. I mean you can, of course, get a considerable amount of radioactivity induced by the neutrons hitting the rocks and the soil and other composition.

Mr. HOLIFIELD. In ordinary concrete structures it would retain a great deal of radioactivity.

Dr. LIBBY. You would have some laid right in them from the neutrons. But the major fraction isn't from this; but is from the material that is natural to the reaction in the bomb itself.

Mr. HOLIFIELD. But nevertheless, it remains as a factor of great hazard.

Dr. LIBBY. Oh, yes. It constitutes what we speak of, I think, when we all think of fallout hazard. We are more inclined to think of the local, within the first few hundred miles, rather than the worldwide type of thing from the stratosphere.

Mr. HOLIFIELD. Yes.

Dr. LIBBY. Now, if we turn to these radioactivities which are produced in the bomb, probably the most important of them is radioactive strontium. Radioactive strontium has a half-life of 28 years. The reasons that it is important are first, that it is chemically similar to calcium which is one of the main mineral constituents of the body. The bone is principally calcium. I mean the inorganic constituents of bone are inorganic phosphate. For this reason radio strontium like calcium is deposited in the bone; but not completely. It is about 30 percent, isn't it, Dr. Dunham? Thirty percent of the radio strontium you eat will be fixed in your bone or something like that? At least that is true for cattle.

Dr. DUNHAM. Somewhere around 20 to 30 percent, in that range.

Dr. LIBBY. It is a small portion of what you eat, but what you do take into your body settles in your bone.

Mr. HOLIFIELD. Let us explain at this point what radioactive strontium is, and what kind of a ray it emits and how it is absorbed into the body, either through eating, drinking, or breathing or—you may have it in your statement?

Dr. LIBBY. I do a little later, but we might just take a minute to sketch it.

It is taken in—well, let's consider plants, for example. The fallout will fall into the soil and the soil will contain it. So the plants will pick it up from the soil. Now, there is a discrimination factor which is against it. But it does pick up a certain fraction, and then also there is a fallout which lands on the leaves of plants that comes down in these raindrops or just by direct falling and sits on the leaves. One of the things that has been developed recently, largely through the use of radioactive isotopes is the important technique of fertilizing crops by spraying their leaves—foliar feeding it is called. Well, we see that in the fallout. We see the efficiency with which the strontium is picked up by the leaves. We see it picked up by the leaves of the plant, and so the plants get it in these two ways, and then the animals will eat the plants. Cows, say, will eat the plants, and it goes into their bodies, and a certain fraction of it deposits—I think you said those data were for cows actually, weren't they, Dr. Dunham?

Dr. DUNHAM. I think the data on human take of strontium is somewhere between 10 and 30 percent that actually is eaten.

Mr. HOLIFIELD. And can that be absorbed by breathing contaminated air, or must it be absorbed through eating and digestive process?

Dr. LIBBY. It is our thought that the main mechanism for absorption is through eating. Now, I am not so sure.

Dr. DUNHAM. The majority of it would be through eating.

Mr. HOLIFIELD. And the animal that would transform most of this as far as mankind is concerned would be the cow and the deposit would be in the calcium in the milk, because the milk is rich in calcium?

Dr. LIBBY. That is right.

Mr. HOLIFIELD. And then the human being could partake of this and it would be deposited in their bones or teeth?

Dr. LIBBY. That is right. Wherever there is calcium in the body you would find it there.

So our problem is to find out how hazardous this is.

Dr. LIBBY. Now, its long lifetime means that it lasts for a good while and has a persistent effect.

And because of its bone-seeking properties, it stays in the body a long time.

The probabilities of body ingestion are high. We say 10 to 30 percent, but those are appreciable figures.

And finally, the fifth reason for its importance is that radio strontium is produced in very high yield in the fission reaction, about 4 or 5 percent of all the fission atoms give radio strontium, which is about as high a yield as you get of any single radioactive isotopes.

Now, in order to orient ourselves about this and see how dangerous it is and whether the situation is what it is, let us consider the maximum permissible of strontium 90 recommended by the National Com-

mittee on Radiation Protection for Atomic Energy Commission Workers.

This is one microcurie for the standard man. The standard man is taken to contain exactly 1,000 grams of calcium in his body, and a microcurie is the amount of radioactivity which is 2.2 million disintegration per minute. That is a microcurie, just to get it into the record.

Now, this maximum permissible concentration is, of course, well below any level at which one would expect any damaging effects to appear. On the basis of experiments with animals, statistically observable increases in the number of bone tumors should not be expected to appear at less than 10 times this level.

As we go above this figure, above 10 microcuries per standard man, above that figure, or 10 times that maximum permissible concentration, the chance for bone tumors occurring increases rapidly, so that the likelihood of bone cancer with 30 to 40 times the minimum amount or 30 or 40 microcuries per standard man is appreciable.

Now, with these numbers we can estimate what the fallout hazard from radio strontium is.

At the rate of 1 kilogram of fission for 20 kilotons of TNT equivalent, 2 megatons of fission energy would be equivalent to very nearly 1 millocurie of radio strontium per square mile, or about 79 disintegrations per minute per square foot of the earth's surface. That is, if it were distributed uniformly, it is just a calculation to give you an idea of the scale.

It is not so unrealistic, you understand, in terms of this stratospheric mechanism I have been talking about. That is you have the local fallout which occurs within a few hundred miles. Then you have a band around the earth in the same general latitude. Then you have this stuff which goes upstairs and spreads around and comes out years later. But because of the long half-life, the radiostrontium lasts, and it does come down. The others don't—they disappear.

Well, there is one other that comes through with strontium. This is cesium 137, and there are a couple of minor ones, but with this kind of storage time in the stratosphere there are only 2 or 3 radioactivities that last long and come down. Strontium is one of them. So we have to watch it.

Now, the average soil of the earth has about 20 grams of calcium in the per square foot which is available for plants. And we have, therefore, considering the maximum concentration that is permissible which is 1 microcurie per standard man, and noting that, as well, as we will see later, that this concentration not be exceeded, the topsoil of the earth should have 10 times that much.

There is a factor of discrimination. We can say that there are 11,000 megatons of fission energy that would be required to produce this average level of radioactivity.

I won't go through that arithmetic for you, but if you divide these numbers you come out with 11,000 megatons of fission energy to produce this level of the maximum permissible concentration in the average of 1 microcurie per standard man.

As I have said, there can be a concentration in the soil which is 10 times greater than that in the men living in the environment.

Mr. BALWAN. Does that mean you would have to have a 1,000 11-megaton bombs that produce that amount of energy?

Dr. LIBBY. I was taking the total. Being 11,000 megatons of fission, distributed uniformly over the earth would produce this.

Mr. BALWAN. Would that be the cumulative effect if we had 11, 1,000-megaton bombs?

Dr. LIBBY. As you can tell, the storage time in the stratosphere is so long; I mean a matter of years; you could do it that way.

Mr. HOLIFIELD. The point is—the point I think, to bring out there, is that if that many of that size bomb were released in warfare, it wouldn't make any difference, anyway; because——

Dr. LIBBY. That, of course, is an enormous outside amount.

Mr. HOLIFIELD. Because the amount that you speak of is so great that it would be enough to destroy every city over a 100,000 and possibly even into the hundred-thousand class in the world.

Dr. LIBBY. It would be horrible; I mean it is difficult to think of it. As I said, a few moments ago, there is the maximum permissible concentration and this is set at the level which is below where we actually expect anything, and we expect things at about 10 times that or about a 110,000.

To be sure about it, as far as we can tell, you see our data—when I finish this sentence I would like Dr. Dunham to put in the record a little bit about the backup for this figure of 1 microcurie per man, but 30 or 40 times this tolerance—we should actually observe increased instance of bone tumor.

This would correspond to 330,000 megatons of fission energy.

Mr. HOLIFIELD. Now, I am going to ask you a question of practical application.

In the immediate vicinity of one of these large yield bombs, would there be enough of the strontium 90 deposited, let us say, on the farmer's crops within an area of 100 or 200 square miles to make the concentration great enough to become much more hazardous than the average for the earth's surface which you have spoken of?

Dr. LIBBY. The answer is "Yes"; the strontium falls about the same proportion as the other fission products, so if you get a heavy local fallout, you get lots of strontium. Now, there is a factor of discrimination; that is, the strontium doesn't fall quite the same way, but it happens to be born—the first atom that is made is a gas—krypton gas.

And this thing lasts for a minute or so, and it finally makes strontium, but this means that it takes a little while before the strontium is born, and some of the particles are born immediately from fission reaction; so there is a little discrimination, but speaking roughly, these are factors of less than 10; and so you get strontium in these regions of local fallout, intense fallout.

Now, this means that the soil in such areas have appreciable amounts of radio strontium. And depending upon the amount of fallout could approach the level where you would have to be careful about the crops.

Mr. HOLIFIELD. Can we measure that?

Dr. LIBBY. Oh, yes, sir.

Mr. HOLIFIELD. It can be measured? All right.

Then would it be safe to say that from a practical standpoint that within a certain restricted area around the bomb explosion contamination of hay fields, corn, and other silage, and that sort of thing would take place, and also open water would be contaminated.

Dr. LIBBY. Yes. On the direct fallout open water would be contaminated. However, I want to say at this point——

Mr. HOLIFIELD. And would that contamination be to the degree that it might be dangerous?

Dr. LIBBY. It could be up to something like this what we call MPC—maximum permissible concentration. So that you would want to measure it and you would want to do everything you could to alleviate it.

Mr. HOLIFIELD. A city that had reservoirs within a distance of 10 or 15 miles, reservoirs of water, which they used for their domestic supply, then, would have to look upon this factor as one to be considered.

Dr. LIBBY. They would have to watch that if they have this dense local fallout. We are talking all the time about this dense local fallout, which we are worried about in the civilian-defense problem, and it is one of the things to be watched.

However, for water which comes down as rain and then runs off into your reservoir, there is a purification of it by the soil. The soil takes it out of it, and the rivers, for example, are relatively free; in our measurements of river waters and those things, we find relatively small amounts of strontium as compared to the soil and the rain. It is a purification by the soil.

But it is not entirely a hopeless situation, Mr. Chairman. There is every good reason to believe that the methods may be found which can decrease the availability of the strontium in the soil to the plants. There are methods which we have in mind and which we are testing for alleviating it.

They are not in my statement for the reason that they are not developed to the place where we are sure, but it is not entirely hopeless.

Mr. RIEHLMAN. Would that affect all types of vegetation?

Dr. LIBBY. It affects them about as they take up calcium. That is, if you have something that has a natural tendency to take calcium.

Mr. RIEHLMAN. What about the vegetation that the human consumes directly without going through the process that you have related?

Dr. LIBBY. You do get some of your calcium that way, but by far the main part of your calcium is milk and cheese.

Dr. DUNHAM. Relatively small, but some.

Dr. LIBBY. In that respect, of course, you are right. You get it that way.

Mr. RIEHLMAN. Direct consumption.

Mr. HOLIFIELD. Would a potato, for instance, tend to absorb that through its leaves?

Dr. LIBBY. Yes. Now, offhand, I don't know how much calcium a potato has. It is pretty small.

Dr. DUNHAM. Mostly water.

Dr. LIBBY. Well, you can get a guide by the mineral content of vegetables. Some vegetables have more than others. We have gone about over the world just measuring all these kinds of things. We have taken samples of all sorts of things, vegetables, soils, rain, animals, and even human bodies.

In the last 2 or 3 years we have measured these in large numbers, so the statements I am making to you are based on these researches of the Atomic Energy Commission.

We have found at the present time there is a rate of fallout of about 1½ millicuries of radio strontium per square mile per year, though I want to say this is an average, and it depends on—and it may change with further measurements, but that seems to be about the rate at the moment, on the average.

It looks like it probably comes down mainly in rain, although fine morning mists and fogs may be particularly effective in this regard, as well as surface contact; that is, winds blowing through leaves, and, of course, direct fallout; that is, direct fallout.

The relative importance of these various mechanisms we are not quite clear on yet, but I think the rain is pretty important, and we are looking at this very closely. It descends on the foliage and the soil and is absorbed.

That which falls on the foliage has a good chance of being absorbed directly into the plant, much in the way the most modern leaf fertilizers operate.

We have to remember that the Eniwetok tests were conducted on coral islands, and as a result, their fallout may be largely water soluble; whereas, if we had rock or sand or something else, we might have a different situation. So if you had a bomb drop in some place in America, and you had a local fallout, it might be less water soluble, less assimilable than the Eniwetok fallout.

It could be. One doesn't know in the absence of complete study of all of these details. We are working hard on it, and I think this is one of the ways in which the Atomic Energy Commission can help in the problem, and we are trying hard to get these data so that the Federal Civil Defense and other people can use them.

Now, in any case, direct measurement of all of these things that I have listed strongly indicates that leaf assimilation is important, and that the soils take it out of the rain and that lakes and reservoirs have only the amount which corresponds to the stuff that fell in them directly; that is, the runoff water will conduct relatively little strontium in it.

The radio strontium is held in the top 2 or 3 inches of most soils. It is held very tightly in the top 2 or 3 inches, and, of course, you can bury it by plowing, and so on, but unless you do that, it stays there as far as we know.

There is some evidence that in some soils it can move farther down, and one of the methods we hope may clean up the dirty farming area or contaminated farming area might be to help move this stuff down by various fertilization methods or to mask it by extensive calcium soaking of the soil.

These two methods are entirely tentative, and we have not had a chance to prove them out yet. The researches on radio strontium conducted by the Atomic Energy Commission have been extensive. Soils on a worldwide basis have been sampled. Sampling has been done by Dr. Alexander of the Department of Agriculture.

Dr. Alexander has with great skill and care repeatedly collected whole series of soil samples for study, analyzed them chemically and submitted them for measurement of radio strontium to the Health and Safety Laboratory of the New York Operations Office, the Lamont Geological Observatory of the Columbia University, and the Enrico Fermi Institute for Nuclear Studies at the University of Chicago.

The fallout has been collected on gummed papers. Milk and cheese has been measured; plants such as alfalfa, animal meat and bone, and even human bodies. On the basis of all this, it is possible to say unequivocably that nuclear tests as carried out at the present time do not constitute a health hazard to the human population insofar as radio strontium is concerned, and it is believed with good reason that radio strontium is likely to be the most important of the radioactivities produced.

It is well to note that since radio strontium is assimilated in the bones, it constitutes essentially no genetic hazard, because its radiations do not reach the reproductive organs.

The milk and cheese radio strontium content is not as high, relative to that of grass which the cows eat, as one might expect. There is a discrimination against the fallout material such that the milk and cheese calcium is roughly one-fifth to one-tenth as radioactive as radio strontium.

There are various explanations of this, and the conclusion itself may not be completely certain, but the data appear to favor it very strongly. In addition, the plant uptake of radio strontium from soil does discriminate against radio strontium as compared to calcium.

The calcium taken up from the soil into the plant in general has about half the radio strontium content that the soil has. These two results protect the human population against ingestion of radio strontium, since milk and cheese are the principal sources of calcium in the human diet.

We find, therefore, that the radio strontium content of human bodies is the lowest of all animals measured and is lower than, by average, soil and the average foliage by tenfold.

I want to say it may be more than tenfold, but this is our present safe figure. The strontium 90 to calcium ratio in young people—these are results of direct measurement—whose bones are still forming corresponds to about one one-thousandth of a microcurie; that is, for an adult, that is one one-thousandth of the maximum permissible concentration recommended for adults, which is 1 microcurie.

The average soil in the United States is about tenfold higher than this, whereas abroad the radio strontium content in other areas of the world not subject to the local test fallout from Nevada is about one-third of that for the United States.

The surface air itself—this bears on your question, Mr. Chairman, about breathing it in—the surface air has strontium in it due to the fallout from the stratosphere that collects between rainfalls, or before it has a chance to be carried down.

Filtration of air at sea level discloses strontium on filters even in periods when bombs are not being tested, such as now. I mean, you can find it if you take a filter and filter the air. You will find it in this room in about the amount that should correspond to the time since the last rain came and washed it down, or some time like 1 week of residence before it gets precipitated.

We have even found it in snow on the Antarctic, collected last winter, January and February of 1955, and this was comparable to what was found in the middle latitudes.

That completes my statement on the facts as we know them about the effects of atomic weapons. I have another section, which is brief, on civilian defense.

Mr. HOLIFIELD. I think we will go right through with that.

Dr. LIBBY. All right, sir.

Now, civilian defense against atomic weapons, of course, must be patterned on the effects themselves. It is clear that in respect to blast and thermal damage for areas close in, evacuation will give the best protection.

If evacuation is impossible, shelters as deep and impregnable as possible will be necessary. Shelters will be most effective in the peripheral areas of damage, and since these are the largest areas one should carefully consider the use of shelters against blast and thermal effects, although in the main central area within a few miles of ground zero, the damage is so enormous that it seems to me that evacuation is the only effective defense for those areas close to ground zero.

The dislocation caused by evacuation is, of coure, tremendous and the problems of supply and housing enormous. All of these gigantic tasks the Federal Civil Defense Agency has been attacking with the wholehearted cooperation of other Government agencies.

The principal passive defense against atomic weapons is—and I want to emphasize this point very much—is one of explanation and education in their effects, so the people will know what to expect and be able to use their good commonsense in protecting themselves.

This is, in my opinion, the first thing and the best thing you can do. For example, just to take an instance, it is quite clear that the thermal damage from a fireball will be alleviated greatly by the use of elementary shielding procedures, just to protect oneself from the heat.

People should be told that it does pay to dodge and to try to get behind shelter. This is particularly true with the large weapons where the scale of events is so enormous and appreciable time intervals elapse.

We mentioned earlier that more than a minute would pass before the blast wave would hit the most outlying regions from a 10-megaton weapon. It was also noted that the fireball would reach its maximum in a matter of several seconds and that the principal emission from it in the case of these large-yield weapons would occur in the first 5 or 6 seconds. These are times in which people can take some effective measures.

It is possible to dodge behind objects in a time interval of this sort, and so to protect oneself to some degree against damage from blast and burns.

Now, I suppose most people know that, but it ought to be certain that everybody does know that, that you can dodge to a certain extent from these effects, especially in the big bombs.

Mr. BALWAN. Are you making any implication in this as to whose responsibility it is to spread the word?

Dr. LIBBY. As I understand it, it is Federal Civil Defense Agency's responsibility. Now, of course, the AEC helps them in every way we can. We try to do everything we can, and we try in this education to—every time we have an opportunity to make a speech on fallout or anything like this, we do it, and we keep doing it, and we try in this way to get the effects out, so that people will know as best they can.

Even with as thorough an understanding as anyone can have, the actual event or experience will be so terrifying and so different that even the best equipped may not be adequate, but certainly it will be

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the best thing you can do to tell people what they can expect and what the reasonable thing to do is. That is the first thing.

Mr. BALWAN. The point I wanted to make here is: That the Atomic Energy Commission merely provides the information of this type on the fact that shielding does help, but it is up to some other agency to pick up that information to make sure that it is disseminated, and not the Atomic Energy Commission.

Dr. LIBBY. Well, we try to do what we can, but it is my belief that it is their function primarily, but we certainly will do everything we can.

Mr. HOLIFIELD. And so far as you know, you have not withheld from the FCDA any information as to weapon effects which is necessary for them to have to formulate plans for the civil defense of the Nation.

Dr. LIBBY. That is right, sir; as far as I know.

Mr. HOLIFIELD. Such declassifications as you have made in regard to weapons have been not in the field of effects, but in the field of construction and component parts and that type of thing?

Dr. LIBBY. You mean such declassifications?

Mr. HOLIFIELD. Yes.

Dr. LIBBY. Yes. We try hard to separate out and to publish and declassify the effects—we try, of course, to protect the construction of the weapons, as you were saying—the principles of operation, and in general one can do a pretty fair job of that.

Mr. ROBACK. May I ask a question, Mr. Chairman?

Mr. HOLIFIELD. Yes.

Mr. ROBACK. When did the Federal Civil Defense Administration first become acquainted with the problem of radioactivity?

Dr. LIBBY. Well, the problem of radioactivity has always been with us, but I judge you mean the large magnitude that the local fallout has. Is that what you mean?

Mr. ROBACK. That is right.

Dr. LIBBY. Well, I believe they had a man actually test it and they have had the documents in their hands. There is a double problem, you see. We can tell them on a classified basis these effects. We can do that, and we do do that, and promptly.

The other problem is to declassify it so that they can use it in this educational function which I think we have been saying is so important. Now, I don't remember, but I would imagine probably by early summer of 1954 they were as well informed on this as we were.

Is that true, Mr. Corsbie?

Mr. CORSBIE. That is true; yes, sir.

Mr. ROBACK. Did that information follow the public revelation of the experience with the Lucky Dragon?

Dr. LIBBY. I don't remember exactly offhand.

Mr. CORSBIE. I think that information followed the appearance of the Japanese story in the newspapers.

Dr. LIBBY. It did.

Mr. CORSBIE. But it was long before the statement on fallout generally to the public.

Dr. DUNHAM. I believe the information you want in dates would be this: That this event occurred about March. A briefing was given by AEC to top civil defense people in June. Early in July they had the

only official report which principally came from—well, it came from the field, prepared principally by the Department of Defense.

This was about—it was before the middle of July—about July 6, 1954.

Mr. ROBACK. Well, was this problem—Did this problem become a serious concern to the AEC only after the 1954 test?

Dr. LIBBY. I think that one can say that we haven't fully realized the scale of the fallout problem. We are speaking of this local fallout, I judge, when we are talking about this matter.

We were aware of the potentialities, but the matter of the scale, I think, we learned something in that experience.

Mr. HOLIFIELD. Dr. Libby, that was a rollcall bell. We have a rollcall coming up right away. Now, you have just a very little left here.

I wonder if it would be possible for you to come back at 2 o'clock for some questions, and I don't think we would need to keep you all afternoon, but I am sure there are questions that the members will want to ask.

So we will finish this, then, when we come back at 2 o'clock, and start on the questions.

Thank you very much.

(Whereupon, at 12:05 p. m. the subcommittee recessed, to reconvene at 2 p. m. the same day.)

AFTERNOON SESSION

Mr. HOLIFIELD. The subcommittee will come to order.

The committee will have a series of questions, Dr. Libby, to ask you. And we know that you are well aware of the borderlines of security. And we know also that you are much interested in getting out such facts as are properly not classifiable to the people of the United States as part of your education program and as part of your responsibility.

I think, maybe, before we start on the questions, we had better finish the section of your last 2 or 3 pages of your statement. I suggest that you start at the beginning and we will have it all together then.

Dr. LIBBY. The problem of civilian defense against atomic weapons must be patterned on the effects themselves. It is clear that with respect to blasts and thermal damage of areas which are close, evacuation will be the greatest protector. If evacuation is impossible, shelters as deep and impregnable as possible will be necessary. Shelters will be most effective in the peripheral areas of damage. And since these are the largest areas, one should carefully consider the use of shelters against blast and thermal effects, although in the main central area within a few miles of ground zero, the damage is so enormous that it seems to me that evacuation is the only effective defense.

The dislocation caused by evacuation is tremendous, and the problems of supply and housing enormous.

All of these gigantic tasks the Federal civil defense agency has been attacking with the wholehearted cooperation of the other Government agencies.

Mr. BALWAN. May I ask a question there?

Mr. HOLIFIELD. Yes.

Mr. BALWAN. What this appears to me—and maybe I am wrong in this—is that there is no use in building shelters in the center of a city? Is that implied here?

Dr. LIBBY. I wouldn't say that quite. But I think there is no use expecting that any shelter will protect you within 2 or 3 miles of ground zero. Or it will have to be a very extraordinary shelter.

Mr. BALWAN. That would revolve around the attraction which a a center of the city has for being ground zero, then, would it not?

Dr. LIBBY. It would involve knowing where the ground zero would be; yes.

Mr. BALWAN. If the center of a city becomes the main attraction for ground zero, then you could say——

Dr. LIBBY. Well, I think you ought to use shelters; but there is no doubt that evacuation is called for in regions which are likely to be bombed, as far as blast and thermal effects are concerned.

The thing is just too overpowering close up.

Mr. BALWAN. The concentration of effort might better be placed in the direction of shelters in the peripheral areas of congested areas?

Dr. LIBBY. I rather think this might be so. Though it is a difficut problem in logistics.

I think what you should do is realize what the hazards are and then see what you can best do just using commonsense. I thing evacuation is certainly the most effective protection for places near the center of the blast.

Mr. BALWAN. But that would be evacuation to shelters; would it not?

Dr. LIBBY. Yes.

Mr. HOLIFIELD. Can we define for the layman what we mean by a target area?

We know that the mililtary have designated some 94 target areas in the United States. Of course, we have designated target areas in other nations too. Would it be a fair statement to say that point zero of a target area would be that which if a bomb were exploded over it would destroy the maximum in industrial production and transportation and distribution facilities?

Of course, incidentally the lives of the people who happen to be in that area at that time also.

Dr. LIBBY. I would think so.

Mr. HOLIFIELD. I am talking now about the more or less civilian center targets and not forts or emplacements like that.

Dr. LIBBY. I think it is difficult, of course, to know just what the military tactics of the enemy would be.

Mr. HOLIFIELD. Yes.

Dr. LIBBY. But I think the principle you stated sounds reasonable. You did omit one thing, however; and that is the fallout effect.

Mr. HOLIFIELD. The fallout would be directed against population, of course. And the blast and thermal——

Dr. LIBBY. That is what I meant to imply, was that if you wanted to use the fallout, then it might be that ground zero might not be where you would otherwise place it.

Mr. HOLIFIELD. In other words, the explosion of a high yield bomb 10 miles upwind from the exact center of a city might accomplish the enemy's purpose without complete destruction of all the modern buildings and facilities?

Dr. LIBBY. I just wanted to bring that out as a principle. Who knows what might be the principles involved in deciding the war

plans? But I think we ought to consider the possibility that fallout might be purposely used.

I mean we have to defend against it; so we have to think about the purposes of it.

Mr. HOLIFIELD. So, it would be difficult under those circumstances to determine your point zero, wouldn't it—very difficult?

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. Because in one instance, the destruction of factories, railroad yards, harbor installations, might be the enemy's objective; and in the other instance, the preservation of those for future use and the destruction of human beings might be the objective.

Dr. LIBBY. Would you, Mr. Corsbie, or Dr. Dunham, like to add anything to this?

It seems to me that these are the main points. And we have now got a complete listing of the main points which would determine what the target would be. And the result is that it is difficult to predict with any certainty.

Dr. DUNHAM. You are talking about uncertainties. And that is the actual success of pinpointing the detonation at the theoretical or desired ground zero, particularly with high level bombing.

Mr. BALWAN. What is the significance of that? Does that mean that it is impossible to detonate that at the limits—well, the limits set for detonating that are pretty broad but you cannot narrow that down so you have got it within 5 feet or 20 feet or 100 feet that you wanted detonated.

Dr. DUNHAM. Under operational circumstances, you do not always have the high degree of accuracy I believe which you can achieve in a peaceful maneuver.

Mr. HOLIFIELD. In other words, we would do all we could in the way of defensive interruption of an enemy bomber coming over, for instance, and it might be that they would have to jettison their bombs at a place where they didn't expect to, or the other different reasons might cause them not to be able to hit the exact point which would be the most desirable.

Dr. DUNHAM. Those are the things I had in mind; yes.

Mr. HOLIFIELD. That is what you meant.

We are going out to the Strategic Air Command and the Continental Air Defense Command, to acquaint ourselves with some of the problems that are involved in offensive and defensive delivery of bombs.

Now, we are in the realm of possibility at this time of the launching of guided missiles from submarines from the ocean to port cities within a close distance to the seashore, are we not?

Dr. LIBBY. I would hesitate to answer that.

Mr. HOLIFIELD. It is a possibility that we have to think about and foresee?

Dr. LIBBY. That is right; yes, sir.

Mr. LIPSCOMB. Dr. Libby, in your statement you say it seems to you that evacuation is the only effective defense. Have you considered the time element in your statement there?

Dr. LIBBY. Well, I was talking about the blast, you see, and the thermal effects.

I don't see how anybody can live in that central region. Of course, you might have a chance if you were in a shelter. But I just don't

see—it is a personal opinion from what I know of the subject—but it just seems to me that evacuation is about it as far as the central region is concerned.

Mr. LIPSCOMB. How far in advance should the people plan to evacuate?

Dr. LIBBY. Well, these questions of mechanism of evacuation are really questions about which I know relatively little. I would say, though, that it seems to me you can't evacuate an area of any size without—I mean with a population of any size—without considerable practice and planning. I believe this is the opinion of the Civil Defense Agency, too. You have to practice, and you have to plan and organize ahead in order to do it successfully.

Mr. LIPSCOMB. Does Civilian Defense consult, or have they consulted, with you as to their plans for evacuation?

Dr. LIBBY. No; not much. I have to refer this to Mr. Corsbie. This is not primarily our business, you see—the movement of people, and so on.

But Mr. Corsbie is the liaison officer between the AEC and the FCDA.

Mr. CORSBIE. We are kept informed generally as to the state of Civil Defense plans and the problems associated with evacuation. But except as we can give them information concerning the range and magnitude of effects we feel that we have no particular competence in the area of advising them concerning the practical aspects of evacuation.

Mr. LIPSCOMB. In other words, it is up to Civilian Defense then to check in regards to the timing, how much time the people will have to evacuate an area and all the other factors.

Dr. LIBBY. I would think so.

Of course, we ought to help them all we can.

Mr. LIPSCOMB. Your only responsibility is to inform Civilian Defense that you feel that evacuation is the best form of defense?

Dr. LIBBY. Really that is a little gratuitous advice on my part. Our responsibilities, as I see them, are to get the facts on the weapons effects to them in the form in which they can use them, and then to do anything else Governor Peterson asks us to do to help them. That is about it. For example, inventing instruments to measure fallout. That is something we can help in, in developing those instruments; because, you see, we are doing instruments for our normal work, and things of that sort.

But the logistics and the planning of these mass movements of population, policing and feeding is a little bit out of our business, quite a bit out of our business.

Mr. LIPSCOMB. In your statement you indicate that Civilian Defense Agency has been attacking this problem wholeheartedly with the cooperation of the other agencies. Do you make that statement on the basis of their soliciting information from you? Or do you offer the information that you have to the Civilian Defense Agency?

Dr. LIBBY. In general we work pretty closely. But, as I say, as far as evacuation policy is concerned, this is not primarily AEC's business. Though we try to keep informed on their activities pretty completely and help them in any way we can. And the agency, I believe, knows that we are at their service and will help them in any way they can name, any way we can.

We have been trying to invent ways to help and to do what we can, to talk with them. We see them frequently, and we have tried to help them in every way we can.

Mr. LIPSCOMB. Of course this is a very important statement to me. I feel that if the most effective thing for the defense of this is evacuation that a lot of stress should be put on this particular phase.

Dr. LIBBY. That is my opinion, sir. And I would say that based on what I know of the effects—and that is, mind you, protection against blast and thermal effects—it seems to me to be the correct way to do it.

Mr. LIPSCOMB. And Civilian Defense Agency is well aware of this.

Dr. LIBBY. I think they agree with it completely as far as I know. Do they not, Mr. Corsbie?

Mr. CORSBIE. I think so.

Dr. LIBBY. I do not see how anyone seeing the damage that is done close in on these bombs could have much—I mean it is very convincing.

Mr. LIPSCOMB. The gentleman behind me answers that he thought so. Is it just in the thinking stage? Or do they know?

Dr. LIBBY. Well, this is a little bit our not being too completely, shall I say, informed on a matter which is not our prime responsibility. If it were on fallout or blasts or thermal, we would give you a direct answer.

This is something we keep watching, because we are interested in the whole problem. I may say, though, that we in the Atomic Energy Commission also have a problem in our own operations. We have some pretty large-scale plants and operations. So, we look at these problems too. I mean from our own interested point of view, as do the other Government agencies.

We all have a stake, of course, in seeing that civilian defense works. And we have a problem not too different from theirs in protecting our own operations.

Mr. LIPSCOMB. I can't help but think, Mr. Chairman, that evacuation is a tremendous problem in civilian defense. And I only look to Los Angeles as one of the areas which perhaps would be a target area. And I can see where it would be a terrific thing to make an evacuation of the city of Los Angeles.

Mr. HOLIFIELD. Well, I think as we go into this more thoroughly, why, we will all come to the conclusion that evacuation is one of the great problems. There are some other great problems too.

Could I pin down at this minute one thing:

You are making your statement in regard to evacuation on the basis of your personal knowledge?

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. That the fireball of a 10-megaton bomb would be approximately 7 or 8 miles in diameter under——

Dr. LIBBY. I think it was three.

Mr. HOLIFIELD. In radius or diameter?

Dr. DUNHAM. Three miles in diameter.

Mr. HOLIFIELD. At a low-point burst?

Dr. LIBBY. That will be the diameter at any altitude.

Mr. HOLIFIELD. Of the fireball?

Dr. LIBBY. Yes. Around sea level.

Mr. HOLIFIELD. But the effect of the spread of that thermal heat would be different if it was exploded at 5,000 feet or at ground contact; wouldn't it?

Dr. LIBBY. Yes, it would.

Mr. HOLIFIELD. And it would increase the diameter of the damage area I am speaking of, rather than the diameter of the fireball itself?

Dr. LIBBY. Yes.

Mr. HOLIFIELD. If I said fireball, I should have said the damage area would be at least 8 miles in diameter, or maybe wider; would it not? And your knowledge is that practically there would be no living thing left within that particular area?

Dr. LIBBY. I wouldn't quite say that. I mean I think probably if you had a deep shelter and everything perfectly arranged——

Mr. HOLIFIELD. Well, because we know that condition does not exist, let's take these cities of America as they exist now and say that with their present preparation for subterranean shelters, and taking into consideration the warning time, taking into consideration the width of the total damage area, that these are the facts that cause you to feel that evacuation is the only answer from that particular area.

Dr. LIBBY. Yes, sir; that is right.

Mr. HOLIFIELD. Did you have anything further, Mr. Lipscomb?

Mr. LIPSCOMB. No, sir.

Mr. HOLIFIELD. Mr. Riehlman.

Mr. RIEHLMAN. Mr. Chairman, I would be anxious to pinpoint more clearly if we can the liaison setup between the Atomic Energy Commission and Civil Defense. Because the statements that you have made certainly impressed the members of this committee of the importance that Civil Defense is aware of what would happen should this Nation be attacked. And I would like to know just how close that liaison is and how that information flows to Civil Defense.

Dr. LIBBY. Would you allow me to ask Mr. Corsbie whose job it is to take care of this function?

Mr. RIEHLMAN. Yes.

Mr. CORSBIE. The information is in areas designated by Federal Civil Defense as being of particular interest to them. Then the information is automatically sent to them under full classification procedures with an invitation to every piece that they extract it, reword it, put it in language which they deem most suitable for civil defense, and for public disseminaion.

With that, of course, is the requirement that it be returned for routine classification and security review. This is a joint undertaking with the Department of Defense, principally because of their large effort in field testing.

As you know, all field tests are AEC–DOD joint undertakings. In the overseas test, it is strictly a military operation in which all of the military, all of the reports, and data, is originally under the cognizance of the military as the reports are being written and disseminated. My office is informed of all pieces that go to Civil Defense. If it contains restricted data, the AEC is asked to pass on that particular part. For information from our civil-effects testing where we have both military-effects program and civil-effects program, which are coordinated before we go to the field and in which civil defense has in 1953 and 1955 participated on a fairly large scale, the information

there is disseminated directly to Federal Civil Defense from Oak Ridge where the final reports are printed.

This involved a very large body of information, routinely and regularly transmitted to civil defense. In addition, information which comes from our laboratories which may or may not have been requested by civil defense but which we think has possible use in civil defense is also transmitted to these same channels.

In addition we frequently go to Battle Creek and more frequently confer with their representatives in the Washington headquarters to discuss or to exchange thoughts on anything in which the AEC might possibly help them. And this involves film, planning to make future films, or coordinating the release of the presently classified film, such as the film of 2 years ago which I am sure all the members saw.

That, Mr. Chairman, I think, gives in broad perspective how the information which we get is transmitted to civil defense.

Mr. RIEHLMAN. In other words, if you have information that you feel is important for civil defense, you immediately pass it on to them?

They don't just have to request that information; is that correct?

Mr. CORSBIE. That is correct, sir.

Mr. RIEHLMAN. And that is true also through DOD?

Mr. CORSBIE. Yes.

Mr. RIEHLMAN. Is the liaison setup similar to that through the DOD? Do you know?

Mr. CORSBIE. Yes; I do know. Because in a large part of it it is a joint undertaking.

Mr. RIEHLMAN. That is all I had, Mr. Chairman.

Mr. HOLIFIELD. To add to Mr. Riehlman's remarks: In this last sentence here "All of these gigantic tasks the Federal Civil Defense Agency has been attacking with the wholehearted cooperation of other Government agencies," I would like to know if that statement that you make is your personal belief, Dr. Libby, or can you say as a matter of personal knowledge that other Government agencies have cooperated wholeheartedly?

Dr. LIBBY. Well, I would not, of course, know as well as I know about the AEC. But that is distinctly my impression.

Mr. HOLIFIELD. This is one of the things the subcommittee is planning to find out, if wholehearted cooperation has been given by other agencies.

But, for the present testimony, you would like to confine your personal knowledge to the AEC?

Dr. LIBBY. Yes, sir. But it is my impression that this other is true, too.

Mr. HOLIFIELD. All right.

Will you proceed?

Dr. LIBBY. The principle of passive defense against atomic weapons is one of explanation and education on their effects. So that the people will know what to expect and be able to use their good commonsense in protecting themselves. For example, it is quite clear that the thermal damage from a fireball will be alleviated greatly by the use of elementary shielding procedures. People should be told that it does pay to dodge and to try to get behind shelter. This is particularly true with large weapons where the scale of events is so enormous and appreciable time intervals elapse. We mentioned earlier that more

than a minute would pass before the blast wave would hit the most outlying regions from a 10 megaton weapon. It was also noted that the fireball would reach its maximum in a matter of several seconds and that the principal emission from it in the case of these large-yield weapons would occur in the first 5 or 6 seconds. These are times in which people can take some effective measures.

It is possible to dodge behind obstacles in a time interval of this sort. And so to protect oneself to a certain extent against damage from blast and burns.

The defense against radioactive fallout consists of two parts: Protection during the first few hours or days, and then the recovery of the contaminated area. The size of the area which can be contaminated by surface bursts of larger atomic weapons is such that it seems unlikely that evacuation will be effective, although it may prove in particular instances that it is practicable and desirable.

One thing is clear: People should be taught about fallout and what measures are effective against it. For instance, it should be known to everyone that 3 feet of earth is good protection. For example, an old-fashioned cyclone cellar with 3 feet of earth would reduce the radiation intensity to one-five thousandth of the unshielded value and a correspondingly smaller thickness of concrete would afford a similar protective mass.

It should be known that distance is helpful. This means that staying indoors, even though the walls of the house may be thin, will help since the fallout is then held at a distance.

The superficial character of the fallout deposit seems obvious and should be reiterated—it is a fine dust or a fine deposit carried down by rain or mist which lies on the surface; or just by straight falling.

It may or may not be visible. We therefore, can think of methods of decontamination and in areas where the fallout is not too heavy and small times of exposure are permissible, one might consider washing the roof of one's house or sweeping and clearing off the yard around the house so as to reduce the radiation intensity. These measures all turn on public information. People will manage to protect themselves if they know the essential facts.

Of course, the second requirement, since you can hardly see the fallout, is that radiation instruments to measure the fallout radiation be available throughout the country and that the people know how to use them. This means that instruments which are cheap and reliable and simple to operate must be produced and their use demonstrated. Real progress is being made in this direction by the FCDA, and the AEC is attempting to help in any way it can in the solution of this important problem.

In concluding my formal statement, Mr. Chairman, I would like to assure the committee that the Atomic Energy Commission is very willing to cooperate in any way that you can suggest or ask us in your investigation. So, please do not hesitate to ask us for any help we can give you.

Mr. HOLIFIELD. Thank you very much, Dr. Libby.

Mr. Kilgore.

Mr. KILGORE. Dr. Libby, first I would like to say that I think the information contained in your statement and the manner in which you have approached it has been of untold value and usefulness to the committee.

In attempting to gain some conception of it from a lay attitude, as is our problem, this thing occurs to me. And without asking you to pass on somebody else's capacity, I wonder if in working with the FCDA if it has been your experience that they have people of sufficient scientific background to fully grasp the sort of information that is made available to them by your agency so far as it may affect their planning and their capacity to plan.

Dr. LIBBY. Well, Mr. Kilgore, in a task of this sort, it is difficult to hire enough technical people to do it. As you know, there is a shortage of technical people, which is very serious. And the competition is stiff for them. So, nobody really has enough. And there are difficulties in all directions due to this shortage.

I think that they have done as well in assimilating this technical information as you could expect, considering the conditions under which they have operated, and so on. I would hope that one of the things we might do to help them in the future is to help in interpreting this technical information for them and make it a little easier for them to assimilate it and get it in useful form.

I think maybe we could help by doing more of this than we have in the past. And we have tried to do everything we could. I think we could help in this way. So, to give you a brief and direct answer to your question, I do not think they do have enough technical people. But there are lots of agencies that do not have enough technical people. They need more. So do a lot of others.

Mr. KILGORE. In that regard, I suppose that the principal part—and there again this is in the realm of their operation, not yours, and something that we will get into certainly in detail with them—but the principal portion of their operation is out at Battle Creek.

Dr. LIBBY. That is the headquarters, yes, sir.

Mr. KILGORE. Would, based on the experience that you have developed, the establishment of an organization within the AEC, not to assume the primary responsibility that Civil Defense is charged with, but perhaps broader than the matter of liaison, on the part of the AEC, the nature of such an organization to be to take over some of the perhaps technical or scientific aspects of the assimilation of information from the AEC and its principal responsibility and the dissemination of that information in a more usable or digestible form to Civil Defense—would that procedure strike you as being any solution to the problem? Or would you lean more toward the increase of availability of people to Civil Defense, if that is possible?

Dr. LIBBY. Well, it seems that, of course, we have been trying to do just that. Mr. Corsbie's job is civilian defense, and how many people would you say that we have in our shop, Dr. Dunham, who spend a good fraction of their time on civilian-defense activities?

Dr. DUNHAM. Well, there is Mr. Corsbie, Mr. Miller, and Mr. Bowman, who is here 2 days a week as special consultant on engineering and structural matters.

In addition, there would be Dr. Western in the biophysics branch, and Dr. Gordon Dunning, who must spend at least 50 percent of their time on matters of direct interest to the Civil Defense Agency trying to pull together data, trying to interpret it, get it into reasonably usable form.

Dr. LIBBY. So we have been trying to create a little task force in our own shop for just this purpose.

Now, during weapons test periods, we have rather special attention paid to civilian-defense problems, and we collaborate wholeheartedly all during these tests.

Dr. DUNHAM. I forgot to mention our Radiation Instruments Branch.

Dr. LIBBY. Yes.

Dr. DUNHAM. Which has been cooperating quite closely with Civil Defense in the development of its instrument program, particularly Dick Johnson.

Dr. LIBBY. Now, if your question means would it be well for us to expand this, say, by a factor of 10, or something, well, we would certainly be willing to consider that if the Federal Civilian Defense Agency thought it would be help to them.

Of course, these paper plans for task forces don't mean much until you hire the technical people, and as I said earlier, there is a shortage of them.

Mr. KILGORE. Well, actually what I was trying to get to, Doctor, was to reach some sort of thinking to determine as an individual member of the committee at what stage or at what point in this chain of command any strengthening which this committee might suggest would be indicated.

If the information that is available to the AEC and made available by you to Civil Defense is adequate for them to do their job, then the question would then turn to Civil Defense and to the Congress and the matter of such planning from that point on.

If sufficient information were not available at that point, then, of course, it would be our responsibility and our job to look back behind it, and I rather gained the impression that it would be your feeling that the information sufficiently interpreted and evaluated to their use is probably available to Civil Defense for their carrying out whatever procedures of evacuation or protection as are indicated.

Dr. LIBBY. Well, Mr. Kilgore, I don't want to leave the committee with the impression that the AEC thinks it has done a perfect job. The problem of education—and I look upon the civil-defense problem as largely one of mass education—it isn't possible to do a perfect job.

You can always do a better job. Now, we would like to think that we have made available to Civil Defense in either classified or unclassified form everything that we have which they can use. We would like to—this is our policy.

Now, making it available to them is only part of it. I mean, it has to be made available in a form in which they can use it, and they have to be able to use it for their own purposes, and I think undoubtedly one could probably find instances where our reports could have been more clearly written, or something like that.

If this seems to be a limiting point in our rate of transfer of information, and the clarity of our reports seem to be a question, we certainly would be most interested in strengthening this effort, but Governor Peterson knows that we are just waiting for his letters and his phone calls on these matters, and we try to do what we can to help him.

I hope we have done a creditable effort. I think we have. I think you would probably find some ways in which we might have done a better one, but we will try to do better in the future.

Mr. KILGORE. I want to say again that I think your attitude is most helpful and most wholesome, Doctor.

Mrs. GRIFFITHS. I would like to ask you about this statement that people will manage to protect themselves if they know the essential facts. Now, wouldn't the amount of radioactive fallout in the air be essential facts right there and then at that moment?

Dr. LIBBY. In a sense it is a hopeful statement that—you, of course, are referring to radioactive fallout in this particular instance. It is a hopeful statement, but I believe it to be a correct one.

Mrs. GRIFFITHS. Well, to know those facts would everybody have to have one of these boxes that you can tell——

Dr. LIBBY. What I would imagine would be a proper situation would be that there would be available in the neighborhood enough so that everyone could know what his local radiation level was, and in particular, he wouldn't be subjected to fallout without his knowing it.

Mrs. GRIFFITHS. Would he have to know the wind drift, too?

Dr. LIBBY. As Dr. Dunham pointed out this morning, that is very important. The high-level winds and the way the things are likely to blow. I think it becomes clear that not only do you need a radiation instrument, but you need some kind of device for communication, and it seems to me, personally, it would be a good thing to combine with this or use with this radiation instrument some type of battery-powered radio, or something of this sort, so that you could keep in touch with the centers of information, for if the fallout occurs, it will be known that, say, half of the State of X is going to be subjected to it, or is already subjected to it.

That information would then lead you to turn on your Geiger counter, or whatever you have, and look. You wouldn't go unknowingly exposing yourself in such an area for hours if you had this information.

Mrs. GRIFFITHS. Would you contemplate it would require, perhaps, one to a block?

Dr. LIBBY. In the cities—this, of course, is a question that is not particularly the business of the Atomic Energy Commission, but I will give you my personal opinion. I would think something like one to a block would be about right.

Mrs. GRIFFITHS. Would there be danger? Would there be danger of people unduly exposed if they went down to their neighbors' who had one to ask them what they could do?

Dr. LIBBY. It might be, but I would like to point out that staying indoors is quite considerable protection against fallout, especially take a building like this, with these massive walls. You have got quite a protection unless it comes in in the ventilation system.

You have got quite a protection. I think probably you would be able to get to your warden or whoever had the counter.

Mrs. GRIFFITHS. But at any rate, to protect yourself, you would have to know some quite scientific facts at the exact moment, wouldn't you?

Dr. LIBBY. I don't want to imply that you would have to have a Ph. D. to survive this.

Mrs. GRIFFITHS. No, not at all.

Dr. LIBBY. I wouldn't know. What would you estimate might be a reasonable course to learn how to run one of these instruments?

They have such a course in FCDA now, do they not?

Mr. CORSBIE. Yes, sir. I believe they are accomplishing this familiarization briefing with the purpose of being able to use an instrument in about two afternoon sessions. Let's say 6 to 8 hours instruction.

Dr. LIBBY. That does include some knowledge of what amounts of radiation one can stand and what liberties one might take with the hazard in order to protect oneself.

Mr. HOLIFIELD. I think at that point, Dr. Libby, it might be wise for you to give the committee a brief statement on what the Atomic Energy Commission has done to develop cheap, fairly cheap, trouble-proof geiger counters.

Dr. LIBBY. I would prefer if you allow me, Mr. Chairman, to pass that question to my colleagues, either Dr. Dunham or Mr. Corsbie.

Dr. DUNHAM. I think as long ago as 1950 the Health and Safety Laboratory of the New York Operations Office of the AEC was working on a cheap, rough-and-ready type of radiation instrument.

With the development of the Radiation Instruments Branch, if it is called that, within the FCDA, there has been close cooperation between the AEC Radiation Instruments Branch, which is located at the Bureau of Standards, and that group, and as soon as developments appeared in any of the AEC installations, that is one of the jobs of our Radiation Instruments Branch, to keep tab with developments all across the Commission in simplification and in increased usefulness, increased hardiness and sturdiness of the instruments—passing that information to FCDA, at the same time FCDA has been in touch with a rather large instrument program in the Department of Defense.

Certainly it has been a joint effort by all three agencies.

Mr. HOLIFIELD. Well, at this time you can tell us if a fairly trouble-proof geiger counter has been developed for civil defense use and if so, about what it would cost the civil defense people?

Dr. DUNHAM. I don't have the figures, but I know they have 2 or 3 instruments which are reasonably sturdy that they are planning to stockpile in considerable numbers and are not outrageously expensive.

I don't recall the exact prices.

Mr. HOLIFIELD. Well, could you give the committee a range? Are they $100, $50, $25, or something in the neighborhood of the price range?

Dr. DUNHAM. I think it depends on two things; one, which instrument we are talking about. There are several for different purposes that read to certain levels, and others are much more delicate, and also on whether we are talking about what it costs to make the prototype or how much it costs when you put it out to bid for several thousand instruments.

Mr. HOLIFIELD. We are talking about what the FCDA will have to pay to get a reasonably practical simple type of radiation detection instrument for use in civil defense. That is what we are talking about, and if you don't have that information, would it be possible for you to get us some information on it?

Dr. DUNHAM. I have it in my office, but I would rather not give you the wrong figures.

Mr. HOLIFIELD. At this time Dr. Libby has presented us an insert for the record which I think will go in at this point in a proper way.

It is entitled "Dosages From Natural Radioactivity and Cosmic Rays."

Without objection, those tables will be inserted at this point, as it is on this subject.

(The material referred to follows:)

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Dosages From Natural Radioactivity and Cosmic Rays

By W. F. Libby [1]

The radiation dosages that people receive from the natural radioactivities and cosmic rays have ben calculated and are given in tables 1, 2, 3, and 4. Some direct observations are given in table 5.

Table 1 gives the dosages in milliroentgens per year for exposures at various altitudes directly over ordinary granite, typical sedimentary rock, and open oceans. Surface dosages decrease with height above the ground because of air absorption; 50-percent reduction occurs for every 370 feet (1). For comparison purposes, it is interesting to note that in the United States, the average exposure rate from total fallout from atomic tests on Jan. 1, 1955, was about 1 mr/yr (2). The total dose during 1954 probably averaged about 15 mr (2), principally because of the Pacific tests in the spring.

Table 1.—*Total radiation dosages from normal background radiation (mr/yr)*

Altitude of ground surface	Ordinary granite		Typical sedimentary rock		Open ocean	
	Equator	55°N	Equator	55°N	Equator	55°N
Sea level	143	147	76	80	53	57
5,000 feet	150	170	83	103	----------	----------
10,000 feet	190	230	123	163	----------	----------
15,000 feet	270	350	203	283	----------	----------
20,000 feet	414	560	347	493	----------	----------

The values listed in table 1 were calculated on the following basis. The roentgen was taken to be 100 ergs of energy per gram of water. (Actually this definition is that of the rad, the internationally recognized unit of radiation dosage. For gamma rays it is nearly equal to the roentgen, which is 93 ergs per gram. The absorption coefficients of all radiations in tissue were taken as being equivalent to those of water. The dosages from the natural radioactivities in the earth were calculated on the approximation that the energy absorbed per gram by the human body on the surface of the earth is, to a sufficient approximation, equivalent to that absorbed per gram by the top layers of the rock of the earth's surface itself from the gamma radiation emitted by the rock (3). In other words, the total gamma-ray energy produced in a gram of granite from the thorium, uranium, and potassium contained was taken to be equal to the energy absorbed per gram of human tissue in the human body on the surface, except that a factor of 2 was used to correct for the geometric loss. It was interesting to observe that this simple method of calculation gave results in good agreement with those based both on separate consideration of each of the complicated radiations emitted by thorium and uranium in the rocks and on the use of the individual absorption coefficients for these radiations in tissue, together with correction for the "build-up" factors as the radiation is scattered and diffuses out of the rock (4).

The abundances of uranium, thorium, and potassium in granite were taken as 4×10^{-6} g/g (1), 13×10^{-6} g/g (1), and 0.03 g/g, respectively (1). In selecting these numbers, it was realized that these were only averages and that fluctuations around these values do occur, that uranium contents as high as 200 parts per million have been found in granite, and that thorium has been found as abundant as 500 parts per million in some granites.

For sedimentary rocks, the general average figure of one-fourth of the values quoted for granites has been used. It is realized, however, that this is very ap-

[1] The author is a member of the U. S. Atomic Energy Commission.

proximate, because the amounts of the various radioactive minerals in the sedimentaries fluctuate widely. The abundances of uranium and potassium in sea water were taken, respectively, as 1.3×10^{-9}g/g(1) and 3.5×10^{-4}g/g(1). The abundance of potassium in the human body was taken as 2×10^{-3} g/g(5), and the abundance of carbon in the human body was taken as 18 percent. For the calculation of the dosage from radium assimilated in drinking waters throughout the normal lifetime, the bone weight was taken as 10 percent for the adult man. But for relatively brief periods of assimilation when the radium would be expected to be concentrated in the small volumes of the bone most metabolically active, the figure of 1 percent was used. All these numbers on the human body were taken as being equivalent to those of the "standard man" (6).

The dosages resulting from cosmic radiation were calculated from the ionization chamber data of Millikan et al. (7). From these data the dosages were calculated at altitudes up to 20,000 feet and at the latitude of 55° N. (geomagnetic) as well as at the geomagnetic equator. The results are given in table 2. It should be mentioned that the biological effects per unit energy may be larger for cosmic radiation, because it consists of high-energy particles rather than gamma radiation.

TABLE 2.—*Cosmic ray dosages*

Altitude:	*Dosages (mr/yr)*
Sea level	33 to 37
5,000 feet	40 to 60
10,000 feet	80 to 120
15,000 feet	160 to 240
20,000 feet	300 to 450

The natural radioactivity in the human body contributes the dosages given in table 3. Of the 19-mr/yr dosage from potassium, 17 mr/yr is from the beta rays of the potassium itself. These were taken to be of a mean energy 40 percent of the maximum energy of 1.36 Mev. The specific activity of natural potassium was taken as 1,800 beta rays per gram, per minute and 180 gamma rays of 1.45-Mev energy per gram, per minute (8). The gamma rays that contribute the remaining two units of the dosage of potassium were calculated on the basis of the assumption that only half of the gamma-ray energy is actually absorbed in the body. This leads to the result that in a packed crowd the radioactivity from the potassium in one's neighbor's bodies contributes an additional dosage of 2 mr/yr.

TABLE 3.—*Radiation dosages from the natural radioactivity of the human body*

Source of radioactivity:	*Dosage (mr/yr)*
Potassium	19
Carbon	1.5
Radium (bones only), uniform distribution	6.7
Radium (bones only), nonuniform distribution	[1] 67

[1] The radium content of the human body is based on data of A. F. Stehney of Argonne National Laboratory.

The dosage from carbon was calculated on the basis of the assumptions that the body is 18-percent carbon; the specific radioactivity of carbon is 15 disintegrations per gram, per minute (9); and that the mean energy of the beta radiation is 40 percent of the maximum energy of 167 kev (8).

In table 4, various ordinary but somewhat unusual circumstances are used to illustrate the types of exposure that can occur in normal living. A wrist watch worn 24 hours per day that has a luminous dial assumed to have 1 μc of radium per watch—a figure perhaps slightly larger than the average—would give the central body, including the sex organs, a dosage of about 40 mr/yr. An airplane pilot flying 24 hours per day with an instrument panel consisting of 100 dials with 3 μc of radium each would receive, at an average distance of 1 yard, a dosage of 1300 mr/yr.

TABLE 4.—*Radiation dosages in various ordinary circumstances*

Radiation source	Location	Dosage (mr/yr)
Wrist watch (1 μc of Ra per watch)	Central body, including sex organs, at average distance of 1 foot.	40.
Luminous dials in airplane cabin (100 dials with 3 μc of Ra each).	Pilot is taken to be at an average distance of 1 yard from the dials.	1,300.
X rays (10)	Lumbar spine, anterior posterior	1,500 each.
	Lumbar spine, lateral	5,700 each.
	Pregnancy, anterior posterior	3,600 each.
	Pregnancy, lateral	9,000 each.
Uranium ore (0.1 percent—the minimum accepted by the AEC for purchase).	Flat surface ground	2,800.
	Mine with all walls of ore	5,600 (neglecting radon).
Phosphate rock (commercial fertilizer 0.01 to 0.025 percent U).	Flat surface ground	280–700.
People	Packed in crowd	2.

In order to check whether the dosages calculated here and given in tables 1 to 4 are essentially correct, some direct measurements reported by various observers are given in table 5. They agree reasonably well with the external component of the total dosages given for sea level in table 1—the residues after subtracting 20.5 mr/yr, the dosage from body radioactivities given in table 3.

TABLE 5.—*Experimental data for hard background radiation (mr/yr)* [1]

Observer	Cosmic rays	Gamma rays		Cosmic and gamma rays (total)	Location
		From air	From ground		
Sievert and Hultquist	44	----	----	121–150	Streets of Stockholm.
	----	----	----	104–182	Over igneous rocks, Sweden.
	----	----	----	94	Clay soil (11).
	----	----	----	104	Wood houses (average center of room).
	----	----	----	145	Brick and concrete houses (types 1, 2) (11).
	----	----	----	296 (max., 520)	Brick and concrete houses (type 3) (11).
Cowan	----	----	----	98	Outdoors, Brookhaven, N. Y., measured (12).
Hess and Vancour	34	2	53	90	Outdoors, Fordham University campus, New York, 1 mile above ground (13).
Burch	31–34	----	62	94–96	Leeds, England (14).

[1] Kindly collected by L. D. Marinelli of Argonne National Laboratory.

It is interesting that the variations in natural dosage are large and under certain conditions the natural dosage may be nearly 100 times higher than the minimum—the dosage of seafarers. The fallout dosage rate in the United States on January 1, 1955—1 mr/yr—was only 2 percent of this lowest natural dosage rate. Of course, during a test period when bombs are fired, the fallout dosage rates may approach, or somewhat exceed, the natural dosage rate for a few days before decay and weathering processes reduce them in a few weeks to rates that are small percentages of the natural background.

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Dr. LIBBY. Mr. Chairman, on this instrument question, if you think it would be helpful to the committee, we would be pleased to bring down and show the committee the instruments. That might be helpful to you, to see them.

Mr. HOLIFIELD. We would like to have it. Will you send some samples up to the committee and also some radioactive material to indicate the manner in which they work for tomorrow morning's meeting, and we will gather about 10 or 15 minutes earlier and have your best man come down and demonstrate them to us.

Dr. LIBBY. We would be pleased to do so.

Mr. HOLIFIELD. And if so, at that time we would like to have approximate prices. We don't mean to pin you down to the prices and ask you to deliver them for that.

Dr. LIBBY. I note here there is a bulletin from the FCDA of January 18 saying that the FCDA today pushed ahead its program to protect Americans from fallout hazard with the announcement that they are planning to purchase $3½ million worth of radiation detection instruments.

That is the largest purchase order in history. It will permit the FCDA to buy for its stockpiles for distribution to States for training purposes 60,000 survey meters to measure radiation rate and 150,000 dosimeters—those are things you put in your pocket—and accessory equipment.

Mr. CORSBIE. Mr. Chairman, I would like to add this to the matter of AEC–FCDA cooperation on instrumentation.

It isn't limited to the low-cost type of instrument. Over the recent past field tests, we have developed methods of monitoring ground and water areas from the air with instruments mounted aloft.

In trying to determine the dimensions of fallout areas such as described by Dr. Libby, this seems to be to us a possible way of a fast determination of the area of principal hazard and of possible use to civil defense.

We put on a training exercise at the Nevada test site from October 17 to 21, 1955, with the Federal Civil Defense Administration designating those to attend for the purpose of becoming familiar with the state of development with the equipment and to determine themselves whether or not this was useful in their civil-defense planning.

Mr. HOLIFIELD. Thank you.

Now, you gave us in your last page here a matter of some simple items which you thought the public should know to protect themselves. Do you have the feeling that the general average American knows these things at the present time?

Dr. LIBBY. I am afraid my opinion is that they do not know them well enough. These things require some kind of instruction. That is, you have to have an instrument in your hand and put it near some radioactivity and see how it responds and get some feeling of the thing.

That is, you might be able to conduct a poll and find that people could answer the questions pretty well, but I am afraid this still isn't enough.

They have to know it well enough so that under conditions of stress and possibly even panic, they could do it, and so I think more training is needed.

Mr. HOLIFIELD. And your second requirement that radiation instruments to measure this fallout radiation should be available throughout the country and people know how to use them, as far as you know, that condition does not exist at this time?

Dr. LIBBY. Not yet, though we are making good progress, I believe.

Mr. HOLIFIELD. Mr. Riehlman.

Mr. RIEHLMAN. Right along that very same line, which ties in with your questioning, you stressed on several occasions during your testimony today, Doctor, the importance of the American people knowing just as many things to do to protect themselves.

How well do you feel that they are informed at this time of those things they can do to protect themselves?

Dr. LIBBY. Well, I would reply as I did to the chairman's question. I think perhaps if you conducted a poll, you might find they know quite a little bit as far as answering questions, but I am afraid they don't know it well enough.

Mr. RIEHLMAN. You feel, then, that it is very important at this time that a very strong program of information and education be set up in the Federal civil defense organization to inform the American people of what they can do?

Dr. LIBBY. Yes, sir.

Mr. RIEHLMAN. And should prepare to protect themselves?

Dr. LIBBY. Yes, exactly.

Mr. HOLIFIELD. Do you feel that this subcommittee is justified in its interest, and also in its concern in regard to this problem?

Dr. LIBBY. I certainly do, Mr. Chairman. I believe the hearing you are conducting will be most important in giving a body of information which anyone can read from and refer to, and I am so happy to know about your plans.

I think this is a very important move in the educational program.

Mr. HOLIFIELD. This is not going to be a 3-day stand, you know. We are going into this thing thoroughly.

Dr. LIBBY. I understand that, sir, and I am most happy to learn it.

Mr. HOLIFIELD. I have a few questions which are basic, which I think we ought to have on the record, if possible.

Your release, the Atomic Energy Commission release of February 15, defined the area of serious fallout from the March 1, 1954, superbomb explosion as roughly 7,000 square miles. Do you regard this as a good planning figure for civil defense?

Dr. LIBBY. Well, it depends on how the winds blow and on conditions of firing. I wouldn't know how to give you a better figure, but I wouldn't want to leave the impression that there is anything magic about this particular area.

Mr. HOLIFIELD. It could be less, according to the size of the bomb and the weather conditions, or it could be larger?

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. But at least it is a medium area that we know from a practical explosion that there is this area of danger.

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. And a pattern of danger can follow?

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. And that, as I remember, was in the very best of weather. Sunshiny and clear, without rainfall.

Dr. LIBBY. Well, I wasn't there.

Dr. DUNHAM. There was certainly not a storm condition. I think it was fairly standard weather for that general area.

Mr. HOLIFIELD. I know the tests were postponed at different times because of prevailing wind or the wrong kind of atmospheric conditions, and the search was for an atmospheric condition which would be the safest and not for an atmospheric condition that might do the most harm.

Dr. LIBBY. Exactly; that is right.

Mr. HOLIFIELD. So when we look upon this figure, we should take those things into consideration.

Dr. LIBBY. That is right.

Mr. HOLIFIELD. Assuming that we use this figure, just for purposes of further questioning, of 7,000 square miles of fallout area, how much of this area do you think would be contaminated to the point where human beings would have to stay out of it for an appreciable length of time?

Can you answer that or not, as an estimate, in square miles?

Dr. LIBBY. I could answer it, but I am afraid I will have to look at the report again. I believe it would be something like one-third of the area.

Would you agree with that Dr. Dunham?

Dr. DUNHAM. Yes, that would be about it.

Dr. LIBBY. I think that is about right.

Mr. HOLIFIELD. One-third of the 7,000 square miles, then, would, in your opinion, be so contaminated that human beings would be wise to stay out of that area for a number of days, and possibly weeks, and months, near the center.

Dr. LIBBY. Well, you see, sir, during the initial period, I am not certain that evacuation is possible.

Mr. HOLIFIELD. Yes.

Dr. LIBBY. It is so hot—or it could be so hot that it is best to stay in your cellar or some place.

Mr. HOLIFIELD. Yes.

Dr. LIBBY. Then, following that you might want to leave or take some other such measures, and I think that probably something like a third of this particular area.

Mr. HOLIFIELD. But at least if you were outside of it, you wouldn't want to go back in without proper radioactive monitoring.

Dr. LIBBY. Yes; and you want to watch and be sure that it is low enough for you to go back.

Mr. HOLIFIELD. Assuming you were 100 miles downwind and were adequately sheltered, what would the wisest course be—to remain under shelter for several hours, or to emerge very soon thereafter?

Dr. LIBBY. Well, I would think you ought to stay in the shelter until the radiation level is low enough for you to travel safely. That depends on the way the wind is blowing and the way the fallout actually occurs. Here is where you need your instruments, and your guidance over your radio to tell you what the countryside is like and just good advice on what you should do.

Mr. HOLIFIELD. Now, if the enemy should attack us, it would be reasonable to assume that there would be a number of bombs dropped at one time, if they could deliver them.

There would be very little from a defense standpoint to be gained by dropping 1 or 2 bombs, and there would be an attempt, undoubtedly, to deliver more than 1, or several, and if this did occur, there might be overlapping areas of fallout which would be doubly exposed, or triply exposed, would there not?

Dr. LIBBY. It could be very well.

Mr. HOLIFIELD. The concept of a target area cannot be confined under the circumstances of this type of weapon explosion to the geographical boundaries of a city or county or necessarily a State?

Dr. LIBBY. No; it cannot be confined to the area we were speaking of this morning, in the blast and the thermal area.

Mr. HOLIFIELD. In other words, the hazard area—and the reason I ask you this is the 1950 Civil Defense Act puts the responsibility upon city officials, county officials, and State officials, to do the job of preserving the lives of their inhabitants—now, this was, of course, legislation which Congress passed before the advent of the hydrogen weapon.

The point of my question is that that legislation must, of necessity, be obsolete in view of the fact that the target area is now larger than the political subdivisions upon which responsibility was placed at that time.

Dr. LIBBY. It is certainly true that the fallout area can reach across boundary lines of States and cities.

Mr. HOLIFIELD. Now, if there is going to be adequate civilian defense in an area for the inhabitants of that target area, we must have a complete civil-defense effort in that area and a complete and coordinated planning in that area, must we not?

Dr. LIBBY. It certainly must be coordinated; yes, sir.

Mr. HOLIFIELD. And if we have, say, 5 cities that happen to be in a target area, and 3 of those cities take measures for self-defense and the other 2 do not, we do not have a maximum civil-defense effort in that area, and therefore, the areas that do not take the same precautions would become a danger to those even who do, would they not?

Dr. LIBBY. It would seem to me so, sir, though I must emphasize that this is somewhat out of AEC's purview, but it certainly seems to me that that is correct.

Mr. HOLIFIELD. Well, we seek your good judgment on this matter as a scientist, and if our deductions seem to be out of line with your knowledge of the scientific impact of these weapons on populations and areas, then we would, of course, respectfully ask you to tell us so.

Dr. LIBBY. Well, it seems to me that the statement you have made is a reasonable one from what I know of the effects.

Mr. HOLIFIELD. Would you care to state to this committee whether you are—as a scientist, and as a member of the Atomic Energy Com-

mission, as well—are convinced that there has been a hydrogen explosion within the Soviet Union?

Dr. LIBBY. I would say we believe—I could say there has been; yes, sir.

Mr. HOLIFIELD. Has the Atomic Energy Commission informed its own personnel as to the action they should take in the event of attack?

Dr. LIBBY. We are in process of doing just that, and to study what measures we should take to keep our plants operating and to perform our functions. It is a large order, and we have, as I said this morning, our own little civilian defense problem right in our own operations.

Mr. HOLIFIELD. Well, that is why I brought that up, because I know that there are approximately 29,000 people employed at Oak Ridge in the atomic facilities there and approximately 18,000 or 20,000 in Hanford, and I am not aware at this time of how many at Savannah and other places.

And so you have a tremendous population, or tremendous group of employees, and in many instances they are in proximity to a great deal of this material, and if those facilities should be targets—and it is reasonable to suppose that they might be considered a military target—and if you believe that this is a serious matter, it would seem to me that you should be taking measures to protect those employees to the best extent possible.

Dr. LIBBY. We have these plans, and, of course, we hope for, through cooperation with the FCDA to get help, but we hope to gain not only protection of our own installations, but by doing these things, to learn things which will be useful to the FCDA, too.

And we are trying to do just that.

Mr. HOLIFIELD. A few years ago I asked the members of the Joint Chiefs of Staff if they had at that time prepared an alternative Pentagon, and my question was a casual one.

I had no idea that I would get a "no" answer, but I got a "no" answer. Since that time I understand that that has been corrected. In fact, it has been placed—there are articles that have appeared in our local press to that effect.

Now, I am going to ask you this question: If the headquarters of the Commission should be destroyed, has your Commission been farsighted enough to plan alternate facilities to carry on the work of your agency?

Dr. LIBBY. The answer is "Yes."

Mr. HOLIFIELD. I am glad to hear that.

I understand from the papers that we are going to have a new AEC headquarters in Germantown, Md.

Dr. LIBBY. Yes, sir; that is true.

Mr. HOLIFIELD. And I would like to ask you if, in the construction of those facilities you are taking into consideration protection, blast pressure against the walls and ceilings, and so forth, in the construction of those buildings?

Dr. LIBBY. We are, sir; yes, sir.

Mr. HOLIFIELD. And adequate underground shelters or shelters which will in your opinion protect your people?

Dr. LIBBY. Do you know, Dr. Dunham, about that?

Dr. DUNHAM. Yes. There are shelter areas planned for the new building.

Mr. HOLIFIELD. Are those shelter provisions adequate if point zero happened to be Washington, D. C.?

Dr. DUNHAM. If point zero were Washington, D. C., they are believed to be adequate, sir.

Mr. HOLIFIELD. Point zero happened to be between Germantown and Washington, D. C. I am speaking now of blast and thermal. Do you think they would be adequate?

Dr. DUNHAM. Yes; I believe they would.

Mr. BALWAN. Are the specifications and design of the AEC Building at Germantown unique in any special way by virtue of Atomic Energy's own knowledge of weapons' effect?

Dr. LIBBY. Well, the architects certainly have instructions to look to the points that the Chairman mentioned in designing the building, and in this sense; yes.

Mr. BALWAN. There is no information which AEC has and which it has passed on to its architects which might not be available, to let us say, the CIA, or the new House Office Building, if they wanted to take care of something like that?

Dr. LIBBY. No; there isn't any information that isn't available to any other agency.

Mr. BALWAN. People would not consider that just because it is AEC they are better protected than anybody else.

Mr. LIBBY. Oh, no; we did move out to Germantown.

Mr. HOLIFIELD. Well, they can't all move out to Germantown; some of us are going to have to stay here I am afraid and pass legislation and appropriations so you fellows can move out there.

Are the AEC scientists and technicians at the various sites encouraged to cooperate with local civilian defense organizations?

Dr. LIBBY. Yes, sir; in anyway they can.

Mr. HOLIFIELD. You can tell us that cooperation has been achieved in those areas.

Dr. LIBBY. I am sorry, Mr. Corsbie had to leave to catch a train, but I believe this is so throughout the whole organization.

Dr. DUNHAM. All the area offices have one man who is responsible for liaison in working out joint plans.

Mr. HOLIFIELD. If you happened to be in a fallout region and you were a civil-defense adviser or official, could you suggest a reasonable or allowable limit of dosage for an adult in the first month of exposure?

Dr. LIBBY. I will have to refer that to Dr. Dunham, I am afraid.

Mr. HOLIFIELD. That could be executed, could it not, Dr. Dunham?

Dr. DUNHAM. It depends upon what you are weighing it against, Mr. Chairman, what other hazard the individual might be exposed to. You could allow a person to take 300 roentgens if he had a better than 50–50 chance of dying if he didn't take the 300 roentgens. You see what I am getting at. There is no absolute figure. You have to weigh it.

Mr. HOLIFIELD. I see. It is a matter of calculation as to the hazards that he would encounter in removing himself from the area?

Dr. DUNHAM. That is right.

Mr. HOLIFIELD. And would the dosage be different for children? Would they be more susceptible than adults?

Dr. DUNHAM. Slightly, but not much more so.

Mr. HOLIFIELD. I think we touched on the drinking water this morning of a city, the possible contamination from fallout?

Do you look upon that as a factor of quite a bit of concern to civilian defense people?

Dr. DUNHAM. Well, I would say that (1) you can get along without water for a day or two; (2) you can tolerate amounts of radioactivity in the water which are well above what Dr. Libby has referred to as the maximum permissible body burdens for peaceful uses for short periods of time. Therefore, you do have a chance to get the situation under control. I would say it was not one of the most serious problems one would have to face.

Dr. LIBBY. There is also another point, isn't there, Dr. Dunham, that you can purify water?

Dr. DUNHAM. That is right, with fairly standard methods.

Mr. HOLIFIELD. Now, we were talking about—during the course of your testimony—about the information transmitted to FCDA. Some of it is declassified, and some of it is classified. Now, in the case of that portion which is classified, is that in your opinion a hindrance to the top officials who receive that information? Is it a hindrance to them in that they can not pass that on to the local civilian defense officials?

Dr. LIBBY. It certainly is a hindrance, and their work would be easier if everything could be declassified. We try to declassify as much as we can as quickly as we can, but the Commission has to weigh these things one against the other.

And I think the situation is that by far the major portion—maybe I wouldn't know exactly what number; but say over 90 percent, can be put in the unclassified category so that they can use it freely.

Mr. HOLIFIELD. Certainly you have given enough testimony today on weapon effects to give facts to the civilian defense people which would enable them to at least start.

Dr. LIBBY. I would hope so; yes, sir.

Mr. HOLIFIELD. Would you recommend protective clothing as a standard item for civilian defense? That is, for civilian defense workers, let us say, monitors, and decontaminators?

Dr. LIBBY. I would offhand say it probably isn't necessary.

What do you think, Dr. Dunham?

Dr. DUNHAM. Well, it is like a lot of other things. If your situation is simple enough so you can do it, it would be nice to do, but you could do a very good job without a lot of fancy protective clothing.

Mr. HOLIFIELD. In other words, the changing of the clothes, the removing of the clothing that was exposed in itself, would be quite helpful; would it not?

Dr. DUNHAM. Oh, yes; taking the clothing off after it has been contaminated.

Mr. HOLIFIELD. And change into clothing which was not contaminated but which might be just ordinary type of clothing?

Dr. DUNHAM. Yes.

Dr. LIBBY. There is an aspect of the fallout that we didn't mention in the testimony this morning, and that is the burn hazard. That is, the fallout if it should fall on your skin. It will burn due to the beta radiation which is a short-range radiation. It will go a millimeter or so into your skin and give you a skin burn. This requires attention to bathing and washing it off.

Mr. HOLIFIELD. It is entirely possible that if the Japanese fishermen had known that this gray ash was radioactive and if they had hosed the decks and ship off with water and washed themselves that their hazard would have been brought down appreciably; would it not?

Dr. LIBBY. It certainly would have, sir, very, very appreciably.

Mr. HOLIFIELD. So any fallout as a result of ash of any kind that can be washed off, immediately, by the recipient, is very important?

Dr. LIBBY. Yes.

Mr. HOLIFIELD. We talked this morning about strontium 90 hazard within the local fallout area.

Could I ask you this: Does there still remain a strontium hazard on Rongelap?

Dr. LIBBY. We have recent data—let's say they were taken the last few months.

Dr. DUNHAM. The most recent reports indicate that the external dose on all of the islands of atoll of Rongelap is now less than the maximum permissible exposure as we use it in our atomic energy installations.

Mr. HOLIFIELD. So from that point of view, the islands are usable again?

Dr. DUNHAM. Right.

Mr. HOLIFIELD. How long has it been since they were first exposed?

Dr. DUNHAM. Just about 2 years and 5 weeks.

Mr. HOLIFIELD. And those islands were how far from point zero?

Dr. DUNHAM. They were, as I recall, about 110 miles.

Do you recall, doctor? I think it was 110 miles from the Rongelap Atoll.

Mr. HOLIFIELD. I think this fact that the strontium 90 hazard existed for a period of 2 years at 110 miles from point zero is an important fact.

Dr. DUNHAM. I think it is very important, Mr. Holifield, but I think it is important to keep this in perspective again. We are thinking in terms of a peacetime condition, and under a wartime condition we wouldn't be nearly as finicky about these things.

Mr. HOLIFIELD. Well, that is true. If it was necessary to go in for a short period, you would go in and take the hazard.

Dr. DUNHAM. Oh, yes.

Mr. HOLIFIELD. But from the standpoint of permanent occupancy, you would not.

Dr. DUNHAM. That is right.

Mr. HOLIFIELD. You would not have used it for permanent occupancy of civilians during this period of time?

Dr. DUNHAM. Well, again it would depend upon your calculated risk as to whether it is better to let them go back to a level that is 5 or 10 times the maximum permanent peacetime exposure or whether it is better to let them all stay somewhere else where they might die of disease and lack of shelter and so forth.

Mr. BALWAN. Are you going to permit the natives to go back to Rongelap?

Dr. DUNHAM. We are considering that right now.

Mr. BALWAN. They have not up to this point been permitted to go back?

Dr. DUNHAM. Not to Rongelap, no.

Mr. HOLIFIELD. Dr. Libby, there has been a great deal of talk in the papers about a cobalt bomb.

Could you comment within the bounds of security on the comparative radioactivity hazard from the use of cobalt, or would you care to comment on that?

Dr. LIBBY. I am afraid I really shouldn't, sir.

I made some general remarks this morning, though, about the effect of the bomb on the surroundings, and most surroundings, the radioactivity comes from the bomb itself.

Mr. HOLIFIELD. I see. There is nothing—let me phrase this question carefully: Is it necessary for civilian-defense officials on the declassified level to know the structure or the component elements in atomic or hydrogen weapons in order to do a good job of defending their people from hazard?

Dr. LIBBY. I dont' think it is necessary, sir. It might be helpful, but remember these weapons are highly technical devices operating on physical laws which are not generally known and which are very complicated, and I think that even if you published all of the details it would have a rather limited usefulness because of the technical complexity of it.

Mr. HOLIFIELD. Enough of the effect of these weapons and of the possible pattern of dangerous radioactivity in your opinion can be revealed, however, to take precautionary methods for survival?

Dr. LIBBY. I believe this is true, and I believe that information now available is adequate to make the proper plans.

This doesn't mean that we should not have a policy of adding to it as we obtain the information, but I do believe that what is now available is adequate to make proper plans.

Mr. HOLIFIELD. If at any time in the future you felt that the declassification of some of this type of information would contribute to the overall defense of the Nation, why, you would have no hesitation in making that known, would you?

Dr. LIBBY. If it were a vital matter, absolutely.

Mr. HOLIFIELD. I have forgotten, Dr. Libby, whether the point of explosion of the 1954 bomb was classified or not. That is, whether it was a power shot or ground shot or drop shot. Was that a matter of classification?

Dr. LIBBY. Well, we call it a surface shot, sir.

Mr. HOLIFIELD. I might just define what we mean by surface shot. We mean the fireball is touching.

If it is good contact so it is appreciably flat, we call it surface shot.

So if the fireball is 3 miles across and it is anywhere within 3 miles of the ground, it is a surface shot.

Dr. LIBBY. Yes.

Mr. HOLIFIELD. Our staff in studying this matter dug up a table which has been made public by the Washington Area Survival Plan Committee, quoting AEC as of August 25, 1955, based on a computation of 3,000 roentgen per hour at 1 mile, 1 hour after the burst of a 5-megaton weapon, assuming the March 1, 1954, bomb to be 3 times greater than this, would give an answer to the above question as about 10,000 roentgen per hour, 1 hour after the burst instead of 3,000, and the figure would correspond to a distance of 1 mile from ground to zero. Then, if that be true, the following extrapolation would be

reasonable as given out according to those who gave it out. Seven hours later, 1,000 roentgen hours, 2 days later, 100 roentgen hours, 2 weeks later, 10 roentgen hours, or 240 days; 1 month, 4 roentgen hours; or 100 roentgen per day; 3 months, 1 roentgen hour or 24 per day; 1 year, two-tenths or 5 roentgen hours per day.

Now, is that a reasonable extrapolation?

Dr. LIBBY. I checked most of the numbers as you read them off; yes, sir.

I must caution you about using this scaling wall beyond about a year. Isn't it, doctor?

After about a year this law which says that tenfold decrease in radioactivity occurs for over sevenfold increase in age, breaks down, and I have forgotten whether it goes———

Dr. DUNHAM. It goes more slowly because you have only left the longer lived products.

Dr. LIBBY. You have about 4 out of the 90 or 60, whatever the original number is, left at that time. Strontium 90, cesium 137, cerium 144, and ruthenium 106.

These are about it at 1 year. So from 1 year on, your table ought to be calculated on the basis of these 4.

Mr. HOLIFIELD. I see. In other words, at the end of 1 year, on a 15 megaton bomb, you would be getting 5 roentgens a day or you would get your 500 dose, accumulated doses, in 100 days at that time; would you not?

Dr. DUNHAM. If this worked out just that way.

Mr. HOLIFIELD. Yes.

Dr. LIBBY. But you see that an instantaneous dose, and during that hundred days you would be having some further decay; so your 5-hour per day applies to the end of the year. But by the time——

Mr. HOLIFIELD. It would be bigger at the beginning of the year. You would have to start out, in other words, larger.

Dr. LIBBY. That is right.

Mr. HOLIFIELD. But even if it were at that period, it would still be dangerous, wouldn't it?

Dr. LIBBY. This is a dose that is well above our normal doses; yes, sir.

Mr. HOLIFIELD. I think that has been made public, and that certainly they are figures that civilian defense can use in measuring patterns.

Now, you made a speech on January 19 which the committee has a copy of, in which you referred to Project Sunshine. Is this a classified project, or could you describe it?

Dr. LIBBY. Yes, sir. I could describe it.

Project Sunshine is devoted to the study of the strontium 90 distribution. I have presented to you many of the results of Project Sunshine this morning and the discussion.

Mr. HOLIFIELD. I was just trying to identify it. That is what it is.

Dr. LIBBY. That is what it is; yes, sir.

Mr. HOLIFIELD. Our staff was somewhat interested in figures which came from your speech of June 3 in which you used a 10-megaton bomb which would have fission products distributed over an area of a hundred thousand square miles. And your speech of February 15, which was—or the release of February 15 in which you used 7,000 square miles. Now, I know that that is not an unexplainable discrep-

ancy. But for the purposes of the record and such confusion as that might cause, would you explain that?

Dr. LIBBY. Well, one of the reasons I did that was to point out to people that there was nothing magic about the 7,000 square miles; just by pointing out some other area.

It was a fairly theoretical type of example. But I chose that to indicate that there might be a different area involved.

Mr. HOLIFIELD. In other words, you were comparing a theoretical assumption with the record of an actual happening?

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. Well, that clears that up.

Was there any reason why the February 15, 1955, release mentioned the radioactivity only for the first 36-hour period?

Was there any reason why this should have been confined to the 36-hour period?

Dr. LIBBY. No.

Mr. HOLIFIELD. Do you feel that that type of a release would have a tendency to confuse the layman in that he might think that the 36 hours was the duration of that radioactivity?

Dr. LIBBY. I am afraid this was an inadvertent omission.

Mr. HOLIFIELD. I am sure it was. There is a reasonable explanation for it.

Dr. DUNHAM. I think the reason for the 36 hours was that this was 36 hours after the fallout which was about the time that the people on those islands were exposed, before evacuation.

I think that is how it got in there. I think also it indicated the rates of decay in the press release so that there should not have been a misunderstanding. I think that the radioactivity continued even beyond that.

Mr. HOLIFIELD. I don't believe that was indicated. That was one of the reasons that caused my question. But I can see where it was a measurement in point of time after the explosion.

Dr. LIBBY. Yes. I am afraid that was an inadvertent omission, sir.

Mr. HOLIFIELD. I asked the question so that the record can be clarified on that point.

Getting back to the subject of protection and what we can do to protect ourselves from radioactive hazard: Is it not true that there were some cheap metal structures on these islands which gave valuable protection to some of our people in comparison to those that were out in the open? I believe they were weather people. In other words, their rate of exposure was less than people out in the open?

Dr. DUNHAM. Very definitely anybody who was inside one of those structures on Rongelap——

Mr. HOLIFIELD. And they were just cheap metal structures; were they not.

Dr. DUNHAM. I think one was a tent which would have given some protection. I think another one was a corrugated metal structure of some sort.

Mr. HOLIFIELD. I think this point is important for civilian populations to know, that in this actual case of exposure there was an unplanned, you might say, protection which occurred as a result of a very cheap metal building.

Mr. HOLIFIELD. Now, if this be true, does this not lend weight to the advocacy of some type of radiation shelters?

Dr. LIBBY. Well I think the ordinary house is not too bad, especially if it has a cellar and has some stories, you know.

Mr. HOLIFIELD. I noticed in the civil-defense tests out in—that is, the tests of weapons out in Nevada—I noticed that some lean-to shelters were in basements, special lean-to shelters; and they gave a tremendous amount of protection in some of those houses that were completely destroyed above ground to dummies and other articles that were placed in there.

Dr. LIBBY. This was against blast and thermal?

Mr. HOLIFIELD. Yes.

So, there are some things that can be done.

Dr. LIBBY. Absolutely.

And my saying that evacuation is probably necessary for the central area, that does not mean that you should not build shelters and think about using them and learn about the opportunities in your own home that you have in your office and naturally available shelters. You should learn about those.

Mr. HOLIFIELD. As a matter of fact, taking into consideration the fact that you will not know where point zero may be, the best overall bet is some type of shelter below ground if possible?

Dr. LIBBY. Yes, sir.

Mr. LIPSCOMB. When we talk about evacuation, are we talking about prior to the blast or after the blast?

Dr. LIBBY. Prior.

That is, for blast and thermal. On fallout, whatever evacuation will be will be well after. I guess that is true. I suppose it is conceivable that you might hear over the radio that there was going to be fallout. Do you suppose that is possible?

Dr. DUNHAM. It is theoretically possible. The question again is: how feasible is it?

Dr. LIBBY. Yes.

But I think for fallout, your evacuation is mainly well after you sit and wait out probably the hottest portion; or else you may be close enough to the edge so you can get out.

Mr. LIPSCOMB. When you speak of evacuation, you are primarily thinking of prior to the blast?

Dr. LIBBY. Against blast and thermal; yes, sir.

Mr. LIPSCOMB. And then the time element is really important?

Dr. LIBBY. Yes, sir.

Mr. LIPSCOMB. And we have your testimony on the time element. We will have to discuss that with someone else?

Dr. LIBBY. I think you should.

Mr. HOLIFIELD. I believe that will be DOD, because they have the responsibility of the early warning time.

Dr. LIBBY. That is right.

Mr. HOLIFIELD. In the forthcoming Pacific bomb tests, will the FCDA have people there, and will in your opinion these tests develop information valuable for civil defense?

Dr. LIBBY. The answer is "Yes" to both questions.

Mr. HOLIFIELD. I don't believe there were civilian-defense people present in the 1954 Castle series, were there?

Dr. DUNHAM. There was at least one observer. There were three people present.

Mr. HOLIFIELD. Were any of those people nuclear physicists?

Dr. DUNHAM. No; not real nuclear physicists.

Mr. HOLIFIELD. Then they would have been of no value in preparing the test reports on damage, particularly?

Or maybe I should ask if they participated in preparing the test reports?

Dr. DUNHAM. No. They were there as observers.

Mr. HOLIFIELD. I understand there are three positions open on the Federal Civil Defense Agency for scientists. Do you know whether any of those have been filled?

Dr. DUNHAM. I do not know, sir.

Dr. LIBBY. We have some positions open.

Mr. HOLIFIELD. I am sorry. I can't qualify.

Mr. LIPSCOMB. Mr. Chairman, along that line: What are the grades that are open?

Dr. LIBBY. I don't know offhand.

Do you know, Dr. Dunham?

Dr. DUNHAM. I don't know. You would have to ask Civil Defense.

Mr. LIPSCOMB. What is the average salary then of a scientist within these agencies?

Mr. HOLIFIELD. I am afraid I can't answer that question.

The question, Dr. Libby, was: What is the average salary of scientists within the Atomic Energy Commission, and are they under the regular grade system of civil service, or are they exempted from it?

Dr. LIBBY. Well, Mr. Chairman, we operate on the contract system. Most of our operations are conducted under contract by outside organizations. And so the salary structure depends to a certain extent on the contractor's salary.

We also have, of course, several thousand employees of the AEC itself. And there are a certain number of scientists in that category.

Now, I do not have, but will be glad to furnish for the record, the exact numbers that you ask for. And I will see that those are sent in.

Mr. HOLIFIELD. Do you know offhand if they are subject to the civil-service grades?

Dr. LIBBY. The contractor's employees are not.

Mr. HOLIFIELD. I know they are not. But I am speaking of the scientists that are hired directly by the Commission.

Dr. DUNHAM. I think they generally do follow the civil service pretty closely.

Mr. BALWAN. We have as an observer a member of the planning commission from FCDA and he probably could answer the question as to scientists.

Mr. HOLIFIELD. Would you identify yourself, please.

STATEMENT OF DEAN POHLENZ, DEPUTY ASSISTANT ADMINISTRATOR FOR PLANNING, FEDERAL CIVIL DEFENSE ADMINISTRATION

Mr. POHLENZ. My name is Dean Pohlenz. I am Deputy Assistant Administrator for Planning, FCDA.

All the positions in FCDA are classified positions and they are civil service. There are no exceptions.

Mr. BALWAN. That includes the ones referred to? Are we correct in the assumptions made about the three positions for scientist?

Mr. POHLENZ. I can't give you a total figure for scientists in the agency. There is one vacancy for a physicist on the research staff and planning staff.

Mr. BALWAN. There is a position, and it is vacant?

Mr. POHLENZ. That is right.

Mr. BALWAN. You have no idea what the salary range might be in following up Mr. Lipscomb's questions?

Mr. POHLENZ. It is a grade 15, which is about eleven-thousand-and-some dollars.

Mr. HOLIFIELD. As long as you have identified yourself for the record, can you tells us if you have any nuclear physicists on your staff at FCDA?

Mr. POHLENZ. No, sir.

In answer to this gentleman's question, there is a staff position for one nuclear physicist and it is vacant now.

Mr. HOLIFIELD. I see.

Mr. LIPSCOMB. Dr. Libby mentioned that there was a lot of stiff competition for scientists. Is that because of the salaries that are paid between private industry and Government, or is it just because of the shortage?

FURTHER STATEMENT OF DR. WILLARD F. LIBBY, COMMISSIONER, UNITED STATES ATOMIC ENERGY COMMISSION; ACCOMPANIED BY R. L. CORSBIE, DIVISION OF BIOLOGY AND MEDICINE; AND DR. CHARLES L. DUNHAM, DIRECTOR, DIVISION OF BIOLOGY AND MEDICINE

Dr. LIBBY. It is because of the shortage. There just aren't enough engineers and scientists and technical people for the needs, the demands, the jobs. There just are not enough. And our problem, of course, is to educate more and to interest more people in such careers.

It is a national problem of the greatest importance. And we see it coming to light again in this inquiry. But every place you look you will see this problem.

Mr. LIPSCOMB. So, it is not the inadequacy of the salaries that the Government is able to pay?

Dr. LIBBY. Well, I wouldn't say that higher salaries would not help Government compete with industry. It certainly would. But industry is short even with their high salaries. So, it is not entirely a question of salaries. I think the fundamental point is that there just are not enough technical people. And what you do is you just raise the salaries, and you steal them from someone else. A good bit of that goes on. But it creates a shortage some place else. We need more.

Mr. HOLIFIELD. These are one or two things I would like to clear up before we conclude and give the other members some opportunity to question if they desire.

In your speech of January 19, the statement is made that it would take a total of 11,000 megatons of nuclear explosions to yield a global fallout of radiostrontium equal to the maximum permissible amount. Now, I assume that his computation was made on the basis of the Castle series test type of weapon and under the same weather and conditions?

Dr. LIBBY. We made this calculation on the basis of worldwide dissemination via the stratosphere; and it was for 11,000 megatons of fission energy. And we simply divided it up uniformly. And I outlined it this morning a little bit in my testimony.

Mr. HOLIFIELD. Now, there is one point that there might be some confusion on.

In your use of the 10-megaton bomb and your assumption of a hundred thousand square miles, would you care to say whether you were talking about the same type of a bomb under different conditions, or were you talking about a different type of a bomb?

Dr. LIBBY. I was talking about—I believe the figure was 10 megatons of fission energy. That is 10 megatons of fission energy was released. I am afraid I cannot go any farther.

Mr. HOLIFIELD. That was merely an assumption that, if that amount was released, that it could cover a hundred thousand miles. But it did not necessarily mean that it would cover it with the intensity that the 7,000 miles were covered in the test?

Dr. LIBBY. That is right.

As you might imagine, conditions where the stuff would go up and come essentially straight down, I suppose, if no winds were blowing, that sort of thing might happen. There would be a sort of dispersal. I don't know what the area might be. If there were absolutely no winds and it went up and a large chunk came directly down, it might be 10 miles by 10 miles, or maybe larger; something on that order.

Mr. HOLIFIELD. On the other hand, if there was a strong wind blowing, there would be a wider dispersal and a lesser intense radiation per square foot or yard?

Dr. LIBBY. That is right.

Mr. HOLIFIELD. Are there any questions that any of the members would like to pursue at this time?

Mr. RIEHLMAN. I think it might be well to have on the record the doctor's attitude toward a recent statement made by General Sarnoff in respect to the tremendous lack of scientists we have in this country.

Did you read his recent statement about setting up an educational program by allocating scientists from industry to give at least a year of their time for the teaching profession?

Dr. LIBBY. I did, sir. And I read it with real pleasure. It seems to me that we have a national emergency. And we have to do something about curing it quickly. And one of the problems is the shortage of teachers. You cannot train teachers overnight. And we do need teachers, particularly in the high schools, to teach mathematics and physics and chemistry and technical subjects so that, when the students go to college, they won't find themselves barred from engineering and scientific studies because of their inadequate or, shall I say, incorrect preparation from this point of view in the high schools. And these people that General Sarnoff referred to can certainly help.

Now, of course, there is a problem of whether they can teach. They know the subject. And that is an old and difficult problem. But it is certainly true that they might help. And I hope something can be worked out so that we can get scientists and engineers who are now educated and of course awfully busy with what they are doing to spend some time helping in this emergency.

Mr. RIEHLMAN. I knew it was a rather broad approach, and I think the general felt that way when he made the presentation. But I think

it is good food for thought and something in the way of a constructive suggestion to alleviate the problem we have in the teaching profession in this particular field, which is so essential to training of scientists for future benefit to our country.

Dr. LIBBY. It certainly was a most valuable suggestion. And I hope it will bear fruit.

Mr. HOLIFIELD. Mr. Kilgore.

Mr. KILGORE. I have no questions.

Mrs. GRIFFITHS. I just want to say that I have enjoyed the presentation here by Dr. Libby.

Mr. RIEHLMAN. I would like to join in that statement.

Mr. ROBACK. I would like to ask this question, Doctor: What order of urgency do you assign to civil defense? Let's assume we are spending at the rate of a hundred million dollars a year for this effort. What budgetary assignment would you make if you were using your judgment?

Dr. LIBBY. It seems to me it is of the greatest importance, and I would have difficulty putting it in dollars, but it certainly is an extremely important effort. We wish to do everything we can as quickly as we can to protect ourselves, and I would hesitate to put it in terms of dollars, Mr. Roback, but I hope my answer is responsive to the question that we should do everything we can.

If dollars can help, we ought to appropriate them.

Mr. ROBACK. Now, do you believe that the Atomic Energy Commission has been belated in making civil-defense information public?

Dr. LIBBY. As I said this morning, we have tried to do a good job, but I don't think we have done a completely perfect job, and I think our performance in the future may be better than it has been in the past, but we feel that we have done a fairly creditable job at making it available.

As I said a few minutes ago, I think we have got enough information out so that the civilian defense can move on an unclassified basis to do a good job of planning to defend the country against an atomic attack.

More could be used, and we should try to get it to them, and one of the problems is learning it. We have to learn these things. The Project Sunshine has taught us quite a lot about fallout that we didn't know and we are learning all the time.

We are learning all the time, and we try to get it over to them as quickly as we get it.

Mr. ROBACK. Is your information as presented here based in part upon findings in that project?

Dr. LIBBY. Yes, sir.

Mr. ROBACK. Is that project completed?

Dr. LIBBY. It is continuing and will continue indefinitely as far as we know.

Mr. ROBACK. Now, with regard to information of that sort, have you, in the course of speeches since you have come into the AEC, have you made public new information, substantially new information, not known to the public before?

Dr. LIBBY. Yes. In nearly every instance there has been something that has not been known to the general public. I would say there have

been—most of the releases have been in the way of reiteration and teaching; that is, repetition is very important in teaching.

You have to say the same thing over and over again in order to teach it, but every release has had something in it that has not been emphasized, perhaps, as widely and as clearly as it should. It may have been declassified and might have been published, but it perhaps has not been emphasized as widely as it should.

Mr. ROBACK. Has all such information there before your making the statement been available to the Federal Civil Defense Administration?

Dr. LIBBY. Yes, sir; they have had the information in general on a classified basis about as soon as we have gotten it. The problem of declassifying it is a problem which we have to work on, and we have worked on it.

The release of it to the public is not just a question of declassification. You have to find a medium, and I think this hearing is going to be a very beneficial thing by once again saying over and over some of the important things, and emphasizing them in new lights and bringing them to mind again and getting people to notice them and think about them and continue to think about them.

This is the kind of thing we need to do, so our releases are a culmination of reiteration and emphasis of new information.

Mr. ROBACK. You made a statement in your presentation which apparently leaves the impression that the effect of the genetic—the genetic effects of strontium, or perhaps other radioactivity, are so far as is known, negligible.

Dr. LIBBY. That is only with regard to strontium.

Mr. ROBACK. As far as other radioactivity effects are concerned, they may or may not be serious.

Dr. LIBBY. If you will allow me, Mr. Chairman, I would like Dr. Dunham to discuss the genetic problem for a minute or two.

Would you mind doing that, Doctor?

Mr. HOLIFIELD. We would like to have that information, sir, if you would care to make it.

Dr. DUNHAM. I am not a geneticist, myself.

Mr. HOLIFIELD. I heard a geneticist speak on this subject one day and when he got through I couldn't understand what he had said. So maybe you will be able to give me some information that we wouldn't understand from a geneticist.

Dr. DUNHAM. You are talking in terms of the long-term effects of a fallout. Was that the basis of your question?

Mr. ROBACK. That is right.

Now, in some quarters that is regarded as a very terribly serious problem. In others, the impression has been left by statements made by the Atomic Energy Commission, or perhaps individual Commissioners, that the problem has been exaggerated.

Dr. DUNHAM. I think both statements are correct. Some people have exaggerated the problem. Others have, perhaps, minimized the problem.

I think the basic problem we are faced with is the lack of actually precise information as to what the genetic effects on human beings are from a given amount of radiation, particularly when we are talking about very low-level exposures over a long period of time.

Mr. ROBACK. So that it is an open question, given the present state of the knowledge, as to whether continued testing may have an adverse genetic effect?

Dr. LIBBY. Oh, no, sir. I can contribute a little bit to that. You see, we do have some experience in that we do have radioactivity in our environment normally, in our bodies, and from the cosmic rays and from the ground, and the test exposure is very small as compared to this radiation everyone receives normally.

Now, this does not answer the question that Dr. Dunham is raising, as to how much radiation it takes to constitute a genetic hazard, but it does point out that we do have normally a very considerable amount of radiation in our everyday lives.

The test exposure is small compared to that, and I think perhaps that was helpful in orienting us on the effects of test exposure on genetics.

Mr. HOLIFIELD. Isn't it true, also, that the Atomic Energy Commission has been making experimental tests on mice and other small animals for several years on this particular subject and that their conclusions from that standpoint have that type of progressive generations of animals to back them up in some of their conclusions?

Dr. LIBBY. Yes, sir. Of course, there remains the question of comparison of a man with a mouse, but we spend a great deal of time and money on our mouse colony in Oak Ridge.

I think it is probably the leading genetic center in the world at the moment from an experimental point of view. I believe that is true. Wouldn't you say, Dr. Dunham?

Dr. DUNHAM. That is true, and certainly the size of the project is greater than any anywhere else in the world.

Mr. HOLIFIELD. And you must be in a high multiple of generations, now, of mice, the experimental animals, are you not?

Dr. DUNHAM. Not very many. The mouse, it is a matter of a year or two before you follow through from one generation to another. That project at Oak Ridge started about 1949. This was all getting our information more precise. I wasn't trying to indicate that we didn't know anything about it, but when it comes to these little fine points—and this is where there get to be differences of opinion and why occasionally there is confusion about it.

Mr. HOLIFIELD. We have also a continuing study on the Japanese victims of Hiroshima and Nagasaki.

Dr. DUNHAM. The study on the first generation has been terminated, because of what you might call the law of diminishing returns. The women are getting past the childbearing age, many of them.

Also, birth control has taken over so that both in the control population and in the radiated population, the birth rate is much lower than it was to begin with.

Mr. HOLIFIELD. I see.

Mr. DUNHAM. We are keeping tab of all the offspring of these people, so that eventually we will probably set up a second generation study.

Mr. ROBACK. Dr. Libby, will you comment on this statement that was in the February publication, the statement by Chairman Strauss in a publication of the AEC?

I quote:

An in-the-air explosion where the fireball does not touch the earth's surface does not produce any serious radiological fallout hazard.

Now, is your statement consistent with that statement, or does it require qualification?

Dr. LIBBY. Yes; it is. In this way, Mr. Roback: When we talk about civilian defense, we are talking about the local type of fallout which may cover several thousand square miles or may cover a hundred thousand square miles.

If you call that our hazard, and fallout, then this statement is right.

Mr. ROBACK. Then this statement read by a layman who doesn't know much about it might be confusing.

Dr. LIBBY. That is a difficult point. The way it goes is this: If you have the large weapons where the fireball and the cloud rise into the stratosphere, then the dissemination is very wide, indeed, and there is a small fraction of the material which falls out within the same general latitude.

There may be even a very tiny fraction which falls out within the vicinity of a few thousand square miles, but the thing that causes the heavy local fallout is the contact of the fireball with the ground, or the surface of the earth, I should say.

Mr. ROBACK. I only have 1 or 2 more questions, Mr. Chairman.

I wanted to ask you to comment on a statement made by a fellow Commissioner, not with respect to making any points of difference, but as to whether you agree with the point made as a matter of fact, or as a matter of judgment.

Now, this is the statement by Commissioner Thomas Murray made in a speech delivered before the Golden Jubilee Dinner at Fordham Law School on November 17, 1955. In this speech, he says—he makes this judgment:

> But the slow process of educating the people in the new habits of thought proper to the age of the nuclear revolution has not been equally furthered by public policies.

Do you agree with that statement?

Dr. LIBBY. Well, Mr. Murray has emphasized a point there which I have mentioned in my testimony today. I think we never do a perfect job of education, and we always could say that we could have done a better one.

I think we have done a pretty fair job, but we will try to do better in the future, and I think that we have reason to believe that we have done a fair job of it. We are all self-critical about this matter, and hope that we can do a perfect job and keep at it and keep improving all along.

In that sense, I agree with his statement. But in the sense that it implies that our job has been catastrophically poor, if any such implication was involved, I do not agree. I think that we have put out information in sufficient quantities so that the civilian defense can attack their problem.

It isn't that we have done a perfect job, but we have done a creditable job.

Mr. HOLIFIELD. Without assessing any blame at all, I think the majority of the members of this committee, one of the things that caused us to think of this study was the fact that we felt that inadequate public information had been spread among the people.

Maybe it has been made known in different instances, but it had not been made known to the ordinary layman.

Dr. LIBBY. That is right.

Mr. HOLIFIELD. And this is one of the good things that we hope will come out of these committee hearings, will be that the hearings and the subsequent report will receive distribution and help along in the understanding of this tremendous problem.

Mr. ROBACK. Now, Mr. Murray continued, and I will read just briefly, Mr. Chairman:

> Twenty-seven Japanese fishermen announced to the world the first fateful news about the lurking catastrophe that may possibly lie in wait for all of us.
>
> In this instance, the official policy of secrecy proved inept when the secret came out through the wrong channels. It shocked the world.

Now, the question that I have is, When could the AEC, had it so willed, have made known information about fallout?

Dr. LIBBY. You catch me a little cold, Mr. Roback. I wasn't a member of the Commission at that time, and my impression is that the Commission made it known—the general overall, not the details as given in the February 15 release—but the general overall existence of this hazard was made known about 4 weeks after it occurred.

Isn't that so, Dr. Dunham?

Dr. DUNHAM. I don't recall the exact dates, Dr. Libby. I would have to check that.

Dr. LIBBY. I think the chairman made a statement on the 31st of March, which was——

Mr. ROBACK. Can we draw the inference from that sequence of events that had this Japanese incident not occurred, that the information may not have yet been known?

Dr. LIBBY. Oh, no.

Mr. ROBACK. What is the ground for the statement, Dr. Libby? Do you feel that AEC was preparing to make its information known?

Dr. LIBBY. Well, as I say, I wasn't a member of the Commission at that time, and I am not aware of what went on in the inner circles, but I can assure you that my position and the majority of the Commission now, all of the Commission now, would have taken the stand of relating it on the grounds of protecting the population against the hazard, and so this very unfortunate accident was not the prime mover in the release of this information.

I don't believe, though I wasn't a member of the Commission, and I cannot speak positively, but I will say had it happened now, it would not be.

Mr. ROBACK. Certainly your own entry to the Commission, you say, was just as important.

Mr. HOLIFIELD. The committee feels deeply indebted for the better than 4 hours that you have given us of your time today. We know how busy you are, and we will all study your testimony.

It might be possible that we might have to ask you at some future time during these hearings to help us out a little bit, and if we do, may we feel free to call on you?

Dr. LIBBY. Yes, sir; absolutely.

Mr. HOLIFIELD. I want, on behalf of my colleagues, to extend their thanks and my personal thanks for your appearance here today and your frank answers to the questions that have been asked you.

Dr. LIBBY. Thank you, Mr. Holifield. It was a pleasure to be here, and I think that you are going to sell many tens of thousands, or circulate many tens of thousands of copies of this hearing.

Mr. HOLIFIELD. Maybe we can make some money for the Government Printing Office.

Thank you very much.

The meeting is adjourned.

(Whereupon, at 4:20 p. m., the subcommittee adjourned, to reconvene at 10 a. m., Wednesday, February 1, 1956.)

CIVIL DEFENSE FOR NATIONAL SURVIVAL

WEDNESDAY, FEBRUARY 1, 1956

HOUSE OF REPRESENTATIVES,
MILITARY OPERATIONS SUBCOMMITTEE OF THE
COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met, pursuant to call, in room 1501, House Office Building, at 10:10 a. m., Hon. Chet Holifield (chairman of the subcommittee) presiding.

Members present: Representatives Holifield, Kilgore, Fascell, Griffiths, Riehlman, and Lipscomb.

Also present: Michael P. Balwan, staff director; Herbert Roback, director of investigations; and Carey Brewer, Legislative Reference Service, Library of Congress.

Mr. HOLIFIELD. The subcommittee will be in order.

Today we are honored to have before us one of the outstanding scientists and public-minded men in America, Dr. Hill.

Dr. Hill, yesterday we had as our first witness Dr. Libby of the Atomic Energy Commission. He was before us for something over 4 hours and gave us a great deal of information on the effects of atomic hydrogen weapons. He was questioned in some detail as to the blast and the thermal effect, also the possible radioactive effect, of these weapons under different conditions, and added to the store of knowledge of the committee quite a bit.

For your information, the committee members have studied the East River project, particularly the 1955 review of the 1952 study which you folks made.

Personally I want to compliment you and members of your study group on the excellent work, the basic work, which you did in your 1952 study, and also in the concise and frank review of that which you gave to the Congress and the people in 1955.

We are not going to confine your testimony today, of course, to that project. We have before us four resolutions, some of which seek to establish the Federal Civil Defense Agency as a cabinet department of Government. Mr. Riehlman's bill seeks to integrate the Civilian Defense Agency with the military structure, with the Department of Defense.

The committee is completely open minded on both of these approaches. I have said before, and I am joined by my colleagues on the committee, I am sure unanimously, in this statement, that we realize that the 1950 Civil Defense Act is now obsolete, in view of the fact that it was written before the advent of the high thermonuclear weapons. The concept of the law possibly to a certain extent is obsolete, and it is to explore this field of legislative need for the Civil

Defense Agency—what the obligation of Congress is in this field, to supply funds, to supply legislative guidance, and of course in the last analysis, in order that we as representatives of the people may discharge to the people our obligation, which is that of course of protecting lives and property in the case of enemy attack, that is our present task.

So we are going to ask you to unbosom your thoughts to this subcommittee and give us the benefit of your extensive knowledge in this field in any manner in which you choose.

Do you have a prepared statement?

STATEMENT OF DR. ALBERT G. HILL, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.

Dr. HILL. No, sir, I don't.

Mr. HOLIFIELD. All right, you may just give us in your own words your thoughts.

Dr. HILL. I am afraid in giving them——

Mr. HOLIFIELD. Will you excuse me just a minute. I should have added that Dr. Hill was formerly director of the Lincoln Laboratory. Is that not right?

Dr. HILL. Yes, sir.

Mr. HOLIFIELD. And was a member of the East River project study group?

Dr. HILL. Perhaps I should clarify that. I was associated with the original East River study, but only as a consultant. When the study group started last spring I was already committed to go to SHAPE for the summer. I agreed only to spend time up until the early part of June in helping them.

I therefore can take very little credit for the report, but I think I can say without being immodest, I think it is quite a good report. I did sign it, because I believed in it, but the credit I get should be very small.

Mr. HOLIFIELD. What is your position now?

Dr. HILL. I am now the Scientific Director of the Weapons System Evaluation Group of the Joint Chiefs of Staff. I am also a professor of physics at MIT.

Mr. BALWAN. I didn't know that Dr. Hill had been appointed as a director for the Weapons Evaluation Group.

Dr. HILL. I think it is effective today.

Mr. HOLIFIELD. Allow the chairman of the subcommittee to congratulate you. We know no man more eminently qualified to take this position than you.

Dr. HILL. Thank you very much. I can add I know quite a few.

If I may make a brief statement, I apologize immediately for saying some things I am sure you all know. But in order to put my views in proper context, I may be a little boring at times.

I think it is impossible to separate civilian defense completely from military defense. I think passive defense and active defense are terms that also are not completely definable, nor should passive defense be confused with civilian defense.

Some passive defense is military and some is civilian, to be sure.

As one goes further, I believe it impossible to talk about the security of this continent without thinking in terms of both the offensive capabilities and the defensive capabilities.

Before the advent of Russian atomic capability and the means of delivering it, we essentially needed only an offensive power. Things have changed. We must have both the power of delivering atomic weapons to potential enemies, and the power to protect our lives and property as well as the offensive power.

No offensive power will be valuable if it is destroyed in a surprise attack. It loses all meaning, and we have had it.

So one must think, I believe, in terms of the offensive and defensive power of the country as part and parcel of the same thing.

Why civil defense? Well, as I view it, wars never start for logical and good reasons. They start for a complex of reasons, many of which are emotional. One can never count on a potential enemy being completely logical and deciding he won't attack us because he himself will be destroyed.

We must therefore have the means for an active defense to protect our people, the means for a passive defense which might protect our offensive power, such as early warning, which is completely passive. Early warning doesn't hurt anything, but it might be the means of protecting our offensive strength, and of alerting our defensive strength.

We must have civil defense to reduce the destruction of lives at least to a minimum because I think it is a truism that no defense can be 100 percent perfect except by some accident in some particular battle, but not in all battles and not in any wars.

So we must have a complex of offensive and defensive strength which is properly integrated. This, I think, includes those things that are properly civilian defense—the protection of lives, primarily—since once an enemy offensive strike gets through, the protection of property will depend on the active defense only.

I could develop this still further. As you know, there have been some news releases lately on our active defense system, which is generally called the SAGE system.

The SAGE system means something a lot smaller than our total active defense, but it seems to be the name for it. This is a very important piece of business and one which we must evolve. We must strengthen it as time goes on to meet ever-advancing threats.

Mr. HOLIFIELD. Do you feel free to say for the record so that the layman who reads may understand, what SAGE is, the general nature of it?

Dr. HILL. Properly, the SAGE system is an automatic data processing system. It takes data from our radar sets, ground observers, from any system which can gather information about an enemy, processes it properly, and delivers it in usable form to the interceptors, NIKE's, and other defensive weapons. Properly, SAGE is only this automatic data processing system. As I say, it seems to be a shorthand for our active defense system within the populated areas.

Mr. HOLIFIELD. In other words, it is our electronic defense system for approaching carriers of weapons, as well as the transmittal of that data to the military headquarters, the defense commands?

Dr. HILL. I think this is an excellent description; yes, sir.

Mr. HOLIFIELD. Proceed.

Dr. HILL. In addition, of course, there is a distant early warning system which gives an early warning to alert the active defenses and to make sure that our offensive strength is not caught napping. This is separate from SAGE.

Mr. HOLIFIELD. It is further advanced on the outposts, and its function is to transmit information back to SAGE?

Dr. HILL. Right.

Mr. HOLIFIELD. Proceed.

Dr. HILL. I am a little at a loss as to how to proceed.

Mr. HOLIFIELD. May I ask you a question on that point, then? From a scientific standpoint, would you give us an appraisal of the efficiency of both the early warning line and the SAGE—not our planned objective in it but our present-day efficiency from the standpoint of being able to give warning of approaching enemy aircraft?

Dr. HILL. I think I would have to make that statement off the record.

Mr. HOLIFIELD. I see. We will pass that, then.

Dr. HILL. Just to add a word about efficiency, I think what the military are striving for is a balance between offensive strength and defensive strength in this country. Also, a balance between potential offensive strength and the defensive strength of this country. In approaching that balance, no one being allwise in these matters, certain imbalances occur.

I still feel we are a little shy on defensive strength, but this is building up and coming along.

Mr. HOLIFIELD. We want very frank testimony on that point. When you say "a little shy," I want to question you, if you are using the right adjective.

This committee is very much interested in helping to protect our Nation and to know where their duty lies, legislative speaking, in order to help defend our Nation.

Dr. HILL. I can best answer that by the statement that the building up of our offensive strength started quite a bit before the buildup of defensive strength. When I say we are a "little shy," I should say we are a little behind in the time scale.

Mr. FASCELL. This is on the overall complex system of both defense and offense you are talking about now?

Dr. HILL. Right.

Mr. HOLIFIELD. You are alluding to the early warning time and the SAGE operation rather than the organization of civilian defense on the local level?

Dr. HILL. That's correct.

Mr. RIEHLMAN. Aside from the timing, are you satisfied with the program as it is now instituted, and the progress that we are making?

Dr. HILL. That is a difficult question, Mr. Riehlman. Had I been the man who had made all the decisions in the past, I am not sure I would have made them any differently than they have been made. I do feel strongly that I would like to see things go faster in the defensive line, and in the offensive line, too. I think both of them should build up a little faster.

The threat we are facing is getting worse all the time, and it is not only the strength of the atomic weapons but the ability of the Russians

to deliver them. I therefore feel quite strongly as a private citizen that I would like to see things go faster.

Mr. RIEHLMAN. Could you enlighten the committee as to what we might do? Do you have any suggestions that would help us to move this program forward faster? Is it the lack of funds, or is it the lack of interest on the part of those who have these programs in charge, or our techniques?

Dr. HILL. I think it is a combination of all three. I think more funds are needed—not tremendously more. I am speaking now without having looked at the 1956 or 1957 budget in detail.

I do think more funds are needed for our overall military strength. I think also in administering these funds we are sometimes so concerned with checks and balances and making sure that everything is spent correctly, that we take an undue amount of time in committing the funds that Congress has appropriated.

Mr. RIEHLMAN. Wouldn't it be true to a greater extent in the scientific world? And that is what we are talking about.

Dr. HILL. I was thinking primarily of the overall military. The scientific effort going into defense and offense is great, but I think it could be stronger.

Mr. HOLIFIELD. Is there a shortage of technicians on the scientific level to do the things that need to be done to produce instruments needed by the early warning line and SAGE?

Dr. HILL. Yes, sir.

Mr. HOLIFIELD. We have had testimony at other times that this is one great factor, that they have had, in the ordinary sense, enough money, but they haven't had qualified scientists to do the original research on the improvement of some of these instruments that we need for protection. Would you or would you not agree with that?

Dr. HILL. I would agree that the country is not producing enough professional technicians at this time, and that this should be a matter of grave concern to us all, and that we should do everything to enlarge the education of professional technicians.

Mr. FASCELL. Dr. Hill, isn't that the crux of the threat that we face right now—the scientific ability of the Russians to deliver what they have? You say we are behind, and we ought to move faster. This is the threat then, is it not?

Dr. HILL. I think we have to look at the problem from a point of view of immediacy and perhaps what we can do in 5 years and perhaps what we can do in 10.

If we started doubling the number of professional people we train in this country—technical people—it would not have much effect for a matter of 5 to 10 years. There are things that can be done immediately, but I think we have to look at that longer-term period, too.

I don't think any of us can predict how long this cold-war situation might go on. Being a scientist might permit me to say that, even if we achieved a real peace, I would still like to see more scientists trained.

Mr. HOLIFIELD. At that point, it might be well for us to clarify the term "technician." That would include general scientists, engineers, physicists possibly. Would you care to express an opinion as to what particular strata of technician are the most efficient?

Dr. HILL. I think they all are. We don't have enough of any of them. The difference between a physical scientist and an engineer is

very small. They belong to different professional societies, and so on, but we need more of all of them.

Mr. LIPSCOMB. Dr. Hill, you mentioned a few minutes ago you felt there was too much stress put on checks and balances. What do you mean?

Dr. HILL. I should have said there is too much stress on the checks. I meant that in my limited experience—and I think here I am getting over my depth and shouldn't lecture you gentlemen—in the normal operation of our Government, which is a very complex affair, it is much easier not to do something than to go forward with a program.

We haven't gone forward, in my feeling, as fast as we should. We worry too much about doing the wrong thing and not enough about getting on with the job.

This is a side comment, and as I say, I am hardly an authority on the subject.

Mr. LIPSCOMB. Do you feel that with Congress appropriating the money, that they spend too much time in checking to see that the money is spent and benefits that accumulate from these expenditures are worthwhile?

Dr. HILL. I think sometimes too much time is spent in committing the money that Congress has appropriated.

Mr. FASCELL. In other words, what we need, Doctor, are less accounting principles and more action.

Dr. HILL. Yes, sir.

Mr. FASCELL. I am glad that I finally had the opportunity for some retaliation at the accountant on this committee, Mr. Lipscomb, for his many kind remarks about the attorneys.

Mr. LIPSCOMB. Do you advocate that appropriations should be made to agencies, commissions, and departments just in a blank-check form?

Dr. HILL. No, indeed; no, sir.

Mr. LIPSCOMB. Do you think that Congress should continually survey the operations of these various programs for their benefits and effectiveness?

Dr. HILL. Absolutely.

Mr. LIPSCOMB. I don't feel that a committee of Congress going in and surveying these programs is a deterrent or would slow up the program.

Dr. HILL. No, sir. I think occasionally some people fear this so much that it gets slowed up; but again, I shouldn't be saying this.

Mr. LIPSCOMB. It concerns me a little. This is a committee of Congress that looks into a great many of these expenditures and programs. I have always had the feeling that it is worthwhile.

Dr. HILL. I agree completely.

Mr. LIPSCOMB. That perhaps sometimes it even accelerates a program. I thought perhaps from your testimony we should just appropriate a blank amount to the Department of Defense for going into an electronics program without trying to compare the benefits with the amount of expenditure.

Dr. HILL. I think I had better say that when I made those remarks, I was not talking about the Congress at all. As I understand our Constitution, Congress is required to do these things and I am all for it.

I am sorry I gave you the wrong impression.

Mr. LIPSCOMB. I just wanted to clarify it.

Mr. RIEHLMAN. Mr. Chairman. To clarify your position, Doctor, I think you attempted to make the statement that the departments

that have the funds are slow in obligating them many times for these projects.

I think you tried to bring that out in your testimony.

Dr. HILL. That is correct.

Mr. RIEHLMAN. Maybe they have good reasons for it. I am just wondering what could be done in the fields where it is absolutely necessary to induce them to move more rapidly. That is something I do not think we are in a position to do because we are not familiar with it.

Mr. Chairman, to get back to this lack of scientists and technicians—and I spoke about it yesterday—you are a student in this field, Doctor, and have had a world of experience, and are one of our outstanding scientists.

General Sarnoff made a statement the other night and I would like your reaction about it. In respect to doing something definite in this country to induce more young people to get into the field of science and then to do something about the educational staff to assist them when we once get them into a school or a college, there is a dearth, in numbers of people who are qualified to teach, and assist in this great field.

His suggestion was that scientists in industry and I suppose a few from the military, if possible, sometime during their period of active life give at least a year's time to this great program in the teaching and instruction field to help promote and to bring into being in the future a larger pool of trained scientists. It has to be some years in the future, as you have suggested—maybe 5 or 10 years—but we are not going to have them unless we start now to do something about it.

I wonder if you would like to make any comment with respect to that suggestion?

Dr. HILL. Those of us who teach in universities often say "Well, we would do a much better job except the secondary schools are not doing their job." This is an easy statement to make.

But I think there is no question, the way the cost of living has gone up, the secondary schools haven't kept up with it and more and more teachers have been forced out to go into other lines of endeavor.

So anything we can do to help the secondary schools in maintaining good science teachers and teachers who can inspire more students to go into the field of science and engineering is all to our advantage.

I think Sarnoff's suggestion is certainly worthy of consideration. I think I heard something this morning that indicates it is being looked into here. I think the National Academy is seeing if the scientists in the area won't devote a little time to helping in the secondary school educational program.

Mr. RIEHLMAN. Certainly, in the period we are living in, it is basic to our survival that we do something definite along that line, is it not?

Dr. HILL. Yes, sir.

Mr. FASCELL. Dr. Hill, we have been talking about a long-range approach to the problem that confronts us. Of course, I am in thorough accord that we ought to take both the long-range and immediate aspects of it under consideration.

In trying to solve the immediacy of the problem, we have talked about cutting the redtape or making funds usable, which is certainly something to consider from the standpoint of internal management of those agencies which are responsible for doing the job.

I think in passing, it is a worthwhile observation. The use of scientists probably in some way immediately might be another way of attacking the problem if we are failing to do that in any way.

I wonder if you would comment on that, and then perhaps what other avenues occur to you that we might attack the immediate problem that confronts us.

Dr. HILL. I think it would be very dangerous if I gave you the impression we are failing to use scientists.

Mr. FASCELL. I didn't get that impression. I just suggested that as a possible avenue.

Dr. HILL. Let's take the military problem. I think the military, since World War II, has made a tremendous effort to increase its scientific strength by hiring good scientists, by letting contracts which would have the effect of giving them more scientific strength.

I have nothing but praise for their efforts. They have been hard put by a variety of things: (1) the fact that we have not had enough scientists; (2) that sometimes in their own laboratories it has been difficult to attract good scientists because civil service rules haven't quite kept up with the industrial pay scale, and so on.

As I see it, wars have become or military operations have become completely technical now, and the only way we can get on with the military organization is by having a very good integration of military and scientific people.

Scientists won't do the job for us; let's face it. There has to be a strong military and a good military system. I think every time they have honestly tried to sit down and work together we have made extremely good progress.

As I say, I think the willingness of the military to sit down and work with the scientists on problems of mutual interest—namely, our own survival—has been very good.

Mr. BALWAN. What is the status of that situation today? Take the Cambridge Research Center, for example. Do we have that type of working together of scientists and military people?

Dr. HILL. Yes.

Mr. BALWAN. Is it just satisfactory, or is it actually very good?

Dr. HILL. I think all of our operations in this field can stand improvement. So from that point of view, they are not satisfactory, but to make a sweeping criticism that they are not satisfactory, and hence someone has been deficient, would be quite wrong.

We, as a country, have been a little deficient. You can't put the blame on any one agency, person, or organization. It is all of us.

We have to move a little faster. Cambridge Research Center suffers from two things: (1) it started right after the war when many scientists wanted in the worst way to get back into peaceful pursuits. I guess we all did.

Secondly, they have had to compete with a rapidly rising industrial scale for scientists and engineers, but they have made some very good contributions to the military program and I think there is no question that Cambridge is a good example of military and civilians working closely together.

There have been some very unharmonious incidents there, as this committee well knows, but they are surviving and coming along.

Mr. BALWAN. We are at the point that the Lincoln Laboratory, which is a military contract with an institution, apparently that the

Government had some reason for going into the contract rather than having the Cambridge Research Center and a military organization do it.

Are we at the point in the relationship between scientists and military people that we must terminate the Lincoln contract and put it in the Cambridge Research Center? Would it be desirable to do that and are conditions such that it could run just as well?

Dr. HILL. I think the reasons which led to the setting up of Lincoln still exist and should lead to the continuation of Lincoln.

Mr. HOLIFIELD. There were engineers and different types of people other than scientists involved in the Lincoln project?

Dr. HILL. Oh, yes, sir.

Mr. HOLIFIELD. I would like to ask you this question, sir: We are depending upon our universities in America to produce our scientists at the present time.

Are the classes with competent teachers overcrowded and overfilled at this time in the different universities of standing?

Dr. HILL. I think they probably are. I am making this on a very limited observation. I think yes; they are.

Mr. HOLIFIELD. In other words, there is a shortage of teachers. There have been different suggestions made.

For instance, one of the most popular suggestions—and it comes from several different sources, including some of these study groups—is that the Federal Government institute a program of financially sponsored fellowships in science.

There has also been another suggestion, that as long as we have free Government-operated academies for the defense of our Nation—West Point, Annapolis, and our new Air College—that there should be a purely scientific academy that would rank on the same scale as these others and would have the financial support for putting a large number of young men through scientific training at the complete expense of the Government, in view of the fact that science has now entered into the field of defense in such an important way.

Would you comment on those different suggestions that have been made, and give us your preference?

Dr. HILL. The one concerning a scientific academy is completely new to me, but I am perfectly willing to comment just off the cuff, and will probably be embarrassed later.

Mr. HOLIFIELD. We might say that your testimony will be in pure confidence with the American people.

Dr. HILL. It seems to me we need military academies to build up an esprit de corps and put professional people into a highly specialized and dedicated business. I don't see any way around it but starting early, at college level, and building up the military point of view and developing the esprit de corps and discipline that this takes.

If we had a purely scientific academy to train all the scientists we need, this would be 100,000 or something a year. It would be a rather sizable case.

Mr. HOLIFIELD. Let's keep it on the modest scale that we have at the academies.

Dr. HILL. What would it do for the people that the universities don't do now?

Mr. HOLIFIELD. I am asking you to tell me.

Dr. HILL. I don't think the universities could train the military. Sure, we have ROTC programs, and they are very important. But their task is to supplement a hard core of military training. I can't see that we need any dedicated bunch of scientists. Dedicated to what? They have to really be dedicated to science, technology and engineering. This kind of dedication can be found in industry and universities and everywhere. It is part of this civilian business.

Mr. HOLIFIELD. I suspected that that would be your answer, sir, but I wanted it for the record. I think it is probably a wise answer.

That would then put the burden on the universities and the boys that are able to go to the universities. Now will you comment on the other alternative suggestion—that possibly the Federal Government should engage in a more comprehensive program of scholarships financed by the taxpayers?

Dr. HILL. I am behind this as much as I can be.

Mr. HOLIFIELD. You think that this would be an important lift to getting us the scientists that we need?

Dr. HILL. Yes, sir. I think the most important. I am convinced that there exists a host of people who will never go to college under our present methods simply because they don't have enough money, and they know this at an early enough age so they don't even consider it, you see. They don't build up any desire to go to college because they can't.

If we could ferret out a few of these, I am sure we could find a lot of first-rate people. Not only for let's say the physical science and engineering, but for medicine and other professions.

I think this would be of extreme importance.

Mr. HOLIFIELD. Of course we know the recent reports are that the Soviet Government has accented the training of scientists and engineers. According to the most reliable figures we obtain, there are graduated about, I think, 25 or 30 percent more per year than in our universities.

Without commenting on the excellence or the degree of training which they do have—because I think none of us are capable of doing that—does this not indicate that America is falling behind in its program of training scientists?

Dr. HILL. Yes. I couldn't agree with you more.

Mr. FASCELL. Mr. Chairman?

Mr. HOLIFIELD. Mr. Fascell.

Mr. FASCELL. Dr. Hill, have we arrived at a point in our society where we have a scientific specialist who applies his knowledge for military purposes only?

Dr. HILL. We have a lot who are essentially doing that, quite a few. But there is no professional field called military scientists.

Mr. FASCELL. Do you think there should be such a field?

Dr. HILL. Here is one I have thought about a lot, and I have never got an answer. I don't know. It is worth considering, I am sure.

Mr. FASCELL. Do you see anything in our way of life in the foreseeable future that would lead us away from military specialists or the application of science to military purposes?

Dr. HILL. I wish I could say I did, but I can't. It seems to me we are going to need this more and more.

Mr. FASCELL. In other words, the problem becomes more intensified?

Dr. HILL. Yes.

Mr. FASCELL. Is there any feeling among the scientific level of people today that the brains of the country are being drained off into military purposes?

Dr. HILL. I would say not enough to be important. Sure, you hear a little about it.

Mr. FASCELL. But it doesn't, in your opinion, affect the work that is being done in any substantial degree?

Dr. HILL. No, sir.

Mr. FASCELL. I meant by that, of course, when the willingness of people to contribute their time and to be dedicated to the solution of these problems.

Dr. HILL. I should point out that a great many items, whose end use now are for purely civilian and peaceful purposes, have grown out of military programs. The airplane being a first-rate example, I would think.

Mr. FASCELL. In other words, it is your considered opinion that although a regimented society might regiment their science, that a free people have no need to regiment their science at all?

Dr. HILL. Generally that is correct. Generally in time of emergency you might have to, but it is my personal opinion that times of emergency of 5 years' duration are past, unless we call the present an emergency.

Now I have sort of got myself in a trap. I said there wasn't a need to regiment. I think there is a need to educate the people that we are in an emergency, and we need more people in the military side of the house.

Mr. FASCELL. In other words, this gets back to your original thought, which was that we face an immediate threat today because of the increasing capability of other societies to deliver the final punch.

Dr. HILL. That's right. We may face an *immediate* threat 15 years from now. It is just the same one, a little harder to cope with.

Mr. BALWAN. I have a question. Going back to the problem of expenditures and costs that was pursued by Mr. Lipscomb a while ago, has most of your appearance in the Government support of programs related to defense of one type or another been in research and development?

Dr. HILL. Yes, sir. Those in which I have had a hand have been research and development, but, naturally, I have been connected with production and operation, too, because research and development is meaningless unless—or, I should say, development is meaningless unless it leads to production and operation.

Mr. BALWAN. To what extent is the establishment of our early warning systems in the research and development phase yet?

Dr. HILL. Properly there is no need for research and little need for development for an early warning system effective against aircraft.

Having established an early warning system effective against aircraft, one wants to improve it; and the threat is continually growing. So one wants to increase always the defensive capability, and this will require research and development, but not on a terribly vast scale.

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Now, there is another threat facing us—I don't know when—called the intercontinental ballistic missile. This requires a great deal of research and development for early warning—"early" now being called 15 minutes, but still very important.

Mr. FASCELL. Right on that point, if you would allow me, that is what I was wondering. At a speed in excess of 1,600 miles an hour, do you get 15 minutes in 100 miles?

Mr. BALWAN. I think the doctor is talking in terms of 5,000 miles per hour.

Mr. FASCELL. I understand that. I say in speeds of an excess of 1,600 miles per hour, do you get 15 minutes time in a distance of 100 miles?

Dr. HILL. It is only a few seconds.

Mr. FASCELL. I understand that, but that raises an immediate question on the early warning system that we are now developing.

Dr. HILL. No, sir. No, the early warning system we are developing is a 2- to 3- or 4-hour system—a lot more than 100 miles.

Mr. BALWAN. Against aircraft?

Dr. HILL. Against aircraft. Now we need another one against ballistic missiles, whose ultimate goal might only be 15 minutes, but it is a very important 15 minutes.

Mr. HOLIFIELD. Could I ask you at this point, to get it down to a practical meaning for us in this civil-defense study of ours: Our early warning line relies mainly upon electronics. What is the practical value of plane watchers individually stationed out and watching for planes in this day of high altitude, above the speed of sound, supersonic aircraft?

Mr. FASCELL. Mr. Chairman, it is not fair to answer your own question.

Mr. HOLIFIELD. These are questions I think should be answered. I happened to be near a radio in the early part of September. It was stationed so close to me I couldn't get away from it in the work I was doing. Every hour, you might say, upon the hour, there was an admonition for the population to troop down and enlist in the Ground Observer Corps. I kept wondering how much of this public time on the radios and the televisions asking for ground observers was directed at an obsolete practice, and how much of it could be of value, assuming that the enemy would take advange of altitude, of darkness, and of other evasive means in order to strike us, if he strikes us?

I wondered at the time if we were not dealing in an obsolete thing, and in a request which brings forth nothing but ridicule, because I asked a lot of people, and they gave me this reasoning, and I think it is important if we are going to have a million of our people standing out on the hillsides looking up at the sky into the clouds, in place of doing something productive.

If that is necessary, that is one thing. If it isn't necessary, I think we ought to have some expert testimony on it.

Dr. HILL. I am not an expert on the operation of the Ground Observer Corps as constituted. So any of my remarks I think stem from my own particular experience in air defense.

Mr. HOLIFIELD. That is exactly why we have you here before us today.

Dr. HILL. If the Ground Observer Corps, say, gets on apartment houses in the Bronx to determine something about airplanes coming to

New York City, they ought to observe the stars or do something else while they are there because they serve no purpose.

On the other hand, you must recall that our air-defense system has been evolving slowly since about 1949. Initially we had radars which could see high-flying aircraft, but because of the curvature of the earth and other effects, they couldn't see low-flying aircraft between the radars.

We wanted some sort of warning for any possible low-flying aircraft. Here the ground observer is quite a useful fellow.

The real problem is not in the fact that he can't see too well or hear too well. It is a communication problem, and if they have very limited range, so to speak, if they can only see or hear an airplane a mile away, then you have to have a lot of them, and then your communication problem gets difficult.

If we can help the ground observer by giving him a little assist which would extend his range a bit—and this may well be done—I am not going on record that it can be done economically at the moment—but it should be looked at, and then in certain areas he becomes quite important.

As one gets away from our populated areas, let's say northern Quebec—there are a lot of people there. There are about enough to form a good Ground Observer Corps. They can be very effective, providing, of course, they have the communications.

Mr. HOLIFIELD. But this appeal that is being made, sir, is not to the people up on our northern periphery. It is being made to the people in Keokuk, Iowa, and the people throughout the South and the West, people in inland cities, and they are building towers for them to stand on, and things like that.

Dr. HILL. As I say, I can't comment on the operation. I don't know. But I can well imagine that a few ground observers in Iowa could be very effective in protecting the approaches to Chicago and St. Louis and Des Moines, for that matter.

Mr. HOLIFIELD. Providing they could see the planes?

Dr. HILL. Yes, sir.

Mr. HOLIFIELD. Does your commonsense tell you if this Nation is attacked, it will be attacked in daylight?

Dr. HILL. I should add that if the plane flies high, the radar net has a very good chance, you see.

If he flies low or at medium altitudes, they may lose him for a period. It is here where the ground observer comes in, in a place like Iowa.

The ground observer is important in supplementing the radar net. In a place, say, that is between our populated areas and Russia, he comes in as an adjunct to the early warning system.

Mr. HOLIFIELD. Are you telling this committee, then, that in your opinion, in this day of supersonic speed, high-altitude flying, that the effort of the Ground Observer Corps is an effort which should be made?

Dr. HILL. Yes, sir, but again, as an adjunct to those things that our electronics system can't do well.

Mr. HOLIFIELD. The advance of enemy planes into the country, if we do have an early warning line, does not have gaps in it. You haven't testified on that point yet, but if we do have that type of an

early warning line, we would catch those planes before they get into the interior, would we not, and pick those planes up?

Dr. HILL. I think I could give you an example. This has been in the public print. We are talking about a distant early warning line over in northern Alaska and northern Canada.

Once that line has been penetrated, we may have very positive indication that an attack is imminent, but we couldn't really say, perhaps, whether it is coming to Chicago, Detroit, or New York. A few ground observers scattered in the geographical interval between northern Alaska, and, say, the populated regions of North America, would be a help.

If he could report, "I saw the man," then we would have further data on what his target was apt to be.

Mr. HOLIFIELD. You are not saying that our early warning system consists of one line of electronic detection devices. Is it not a fact that it is a defense in depth?

Dr. HILL. Yes, sir, but not complete depth.

Mr. FASCELL. Doctor, is that horizontal and vertical?

Dr. HILL. Yes, sir.

Mr. HOLIFIELD. What method of electronic warning do we have from the Pacific Ocean and the Atlantic Ocean? Do we have as efficient a line of early warning as we have in the northern part of the hemisphere?

Dr. HILL. I think I ought to go off the record on that one. I would be very glad to answer it, but I think this is——

Mr. HOLIFIELD. I am going to allow you to use your judgment on that. We might require some information in executive session on that.

Mr. Fascell?

Mr. FASCELL. I just wanted to inquire about ground observers again because I share your feeling more or less on this subject.

Doctor, do I understand, now, your feelings on this question of ground observers is that they can be useful in a limited and selective sense as long as they are integrated as an adjunct to an existing system?

Dr. HILL. Yes, sir, and they may need a little assistance by mechanical or electronic contrivances.

Mr. FASCELL. But to be effective, the Observer Corps should not be an isolated unit, but should be an integrated unit?

Dr. HILL. Absolutely.

Mr. BALWAN. It is entirely possible, with the screen that we have, for enemy aircraft to creep through and be undetected as far as Iowa?

Dr. HILL. You said the screen we now have?

Mr. BALWAN. The screen we now have.

Dr. HILL. I think that can only be answered in terms of what we have now, what we are building up to, and what the time scale is.

Mr. BALWAN. I am trying to relate it to the Observer Corps here. You mentioned it is a necessary adjunct. It implies that the situation is such that there is a great probability that planes can get through our defenses and be undetected?

Dr. HILL. There is always that probability, yes.

Mr. BALWAN. Can you talk about the degree of the probabilities for these break-throughs?

Dr. HILL. Here I have to relate it to the time scale. Here I feel I would have to go off the record again.

I thought I said that the Ground Observer Corps can be a very valuable adjunct to the military department. To say it is necessary requires more wisdom than I possess.

Mr. HOLIFIELD. Of course, that is assuming that the evasive action of the enemy were such that the Ground Observer Corps could see it.

Mrs. GRIFFITHS. Mr. Chairman, may I ask a question?

Mr. HOLIFIELD. Mrs. Griffiths.

Mrs. GRIFFITHS. May I ask you, is this observer in Keokuk, Iowa, watching for one plane or several?

Dr. HILL. I would say probably several.

Mrs. GRIFFITHS. He is watching for several. Is he watching for a high-flying or a low-flying plane?

Dr. HILL. Either.

Mrs. GRIFFITHS. Would he be able to see a high-flying plane?

Dr. HILL. Probably not.

Mrs. GRIFFITHS. So then he is watching realistically for a low-flying plane and he is watching for several?

Dr. HILL. Yes.

Mrs. GRIFFITHS. Will those planes, in your judgment, be capable of destroying a large American city?

Dr. HILL. Yes, I think so.

Mr. HOLIFIELD. Mr. Kilgore?

Mr. KILGORE. Go ahead, if you have a question.

Mr. HOLIFIELD. I was going to say I believe the attrition rate of planes in World War II, in our forays on the different European tragets, such as Regensburg, Berlin, and others, the attrition rate, I believe, was up around 5, and possible 7 percent in extreme cases.

In most instances it was not quite that bad. What would you say the attrition rate is on enemy planes coming into our country at this time?

Dr. HILL. It would be better than 7 percent, I am rather convinced. This will depend somewhat on tactics of the enemy. If he chooses the wrong ones, it can be a lot greater.

I think to give an adequate explanation of this, again I would plead off the record.

Mr. HOLIFIELD. Surely.

Dr. HILL. Could I add something to this?

Mr. HOLIFIELD. Yes.

Dr. HILL. If one studies the attrition rates of planes in World War II, one finds a great variety of circumstances. By the time the big raids of the United States and Britain started on Germany, the attrition on their own fighter force had been great.

The great number of bombers we sent were able to inflict a great deal of damage on the German fighter defenses. So their effectiveness went way down.

On the other hand, on occasion, one finds a quite substantial fluctuation in the attrition rate upwards.

Mr. HOLIFIELD. Of fighters or bombers?

Dr. HILL. Of bombers. These cases are unusual, but one gets the feeling that they are not necessarily impossible or unrepeatable. It is my own feeling we can establish a much higher rate of attrition than World War II figures against aircraft.

This is, of course, what the Continental Air Defense Command and some of its helpers like Lincoln, Bell System, and so on, have been trying to do. To answer forthrightly what we might expect is awfully hard.

Mr. HOLIFIELD. Let us assume, just to pick a figure out of the air, that the attrition rate of enemy bombers might rise as high as 25 percent on a foray coming into the country.

That would leave 75 percent that might get through our outer defenses. As I recall, we sent out from England against Germany many of our flights numbering from 500 to 700 bombers at a time.

These bombers were carrying blockbusters, 5,000-pound variety. We have had testimony before this committee that indicates there may be 10-million ton hydrogen weapons; there may be.

I believe in your Lincoln report you go up as high as possibly 50 megatons. Assuming just for the sake of this discussion a 10-megaton bomb is possible, if 1 plane gets through, unless our attrition rate, in other words, is almost complete, if 1 plane gets through to the target and drops 1 bomb, the target is destroyed.

Where we had to pound Regensburg and other targets in Germany for months with hundreds of bombers before we finally fixed them up, 1 plane with 1 bomb today that gets through the line can destroy any military target.

So in a situation like that—and I am asking this because we are seeking to find means of defending the American people from such a get-through—is it not true that defensively speaking, that we have lost tremendously, percentagewise, in advantage, and that offensively speaking, at this time in history, the offense has a tremendous advantage?

Dr. HILL. You recall at the outset I said we can't consider defense alone. We can only consider defense in terms of offense.

We must, in doing this, rely—and I hate to say this—on the commonsense of a potential enemy. We have to pray that if they feel they will be destroyed in return, they won't start anything.

So one of our primary purposes is to make sure that after a surprise attack, or let's say after an initial attack, that we have enough left to destroy them.

About defense, it is my own feeling——

Mr. HOLIFIELD. Before we leave that point, we can't rely on that, though, or else there would be no need for our having any civilian defense at all—I mean, if we could rely on the fact of their fear.

Dr. HILL. Not if they feel they can destroy our offensive power in the first attack so that they have nothing to fear.

Mr. HOLIFIELD. Yes; but that is military. Now, we are getting into a military retaliation, which I agree with you is probably the great deterring effect at this time against war between nations, this fear of retaliation on both sides, probably.

But assuming we cannot rely on that completely, what value do you place upon having an effective civil defense which can withstand the shock of such a get-through as is possible now under modern offensive conditions and to come back, both from the standpoint of retaliation and from the standpoint of existence and continued production?

Dr. HILL. I think we must have a civilian defense for the reason that, in the event a war starts we can at least get back on our feet as fast possible and that we can save lives.

I don't think a civilian defense will save property. It will save lives to reconstitute the property. I think this is very important.

Mr. HOLIFIELD. Can we have a continued military defense unless we do have an effective civilian defense to keep the centers of population in as near normal condition and continuity as possible, and also in a position to produce the implements of war that may be needed?

Dr. HILL. I think it is impossible to defend our offensive strength without defending the civilian population as well.

Mr. HOLIFIELD. My line of questioning is intended to elicit from you your judgment as to the necessity—the degree of necessity—of civilian defense in relation to our military capability, both as to offense and defense.

Dr. HILL. I feel that if in discussing civilian defense we discuss the matter of shelters and warning time, protection against the effects of fallout, and so on and so on, that even a large bomb on a large city would not prevent us from getting that city back in some sort of working order in not too long a time scale.

Mr. HOLIFIELD. Are you going to ignore the permanent contamination or semipermanent contamination by radioactivity?

Dr. HILL. Opinions here seem to differ widely. If there is, let's say, a contamination of a year, which is lethal, obviously that city is out. I don't know enough about this to comment.

Mr. HOLIFIELD. We had a scale yesterday presented to the committee. Dr. Libby, I think, gave an acquiescence to the scale of extrapolation by the Washington Survey Planning Committee, I believe it was, which had indicated that at the end of 1 year a 15-megaton bomb would leave enough radioactivity on a ground burst where the fireball reached the ground, that at the end of 1 year the roentgens would be from an accumulative standpoint dangerous for human occupancy.

So in a situation like that, we are faced with the problem of whether any military target will be of use in that particular war, once it is hit by a thermonuclear bomb, are we not?

Dr. HILL. I am afraid you are right. I do think there are degrees to which a certain utility might be made. For instance, although it might be impossible for the civilian populace to live in a city, freight trains might move through it, which would repair the steel works which had gone down, or build some new ones and so on. So I think it is a little dangerous to say flatly that a given area of country can't be used. You might still use it for some things.

Mr. HOLIFIELD. Are you of the opinion that if an atomic-hydrogen war should break out, it would be a war of years, or do you think if each side went at each other with these weapons, that it would be shortened to a matter of weeks or months?

Dr. HILL. I think it would be a very short war, but we would be a long time getting back on our feet. We might starve a city in so doing, you see. If we isolated the transportation system to New York City, they would starve to death in a rather short period.

It is things of this sort that civilian defense must concern itself with.

Mr. HOLIFIELD. That is the thing we are concerned with—that these potential dangers exist at this time—today. Yet there is no effective

action being taken, and there is no apparent drive to take care of this phase of our overall defense effort such as there is, for instance, in the military offense and defense area.

Again, as I say, we seek from you your judgment as to whether the defense of the Nation is not dependent equally upon a civilian defense as it is upon the military defense.

Dr. HILL. I will evade the the word "equally," to say that they are both very important.

Mr. HOLIFIELD. Would you say it is more important than the ratio of $85 million a year for civilian defense, compared to $35 billion for military defense?

Dr. HILL. Yes.

Mr. HOLIFIELD. Do you feel that the Civil Defense Act of 1950 is obsolete?

Dr. HILL. To the best of my knowledge; yes.

Mr. HOLIFIELD. You, of course, are aware of the fact that it depends upon local political subdivisions for the organization and operation of civilian defense and financing, for almost 100 percent. There is some of this $85 million which can be spent nationally. There is some help in the field of—let us say—medical supplies and possibly blankets and other shelter and necessities—food, possibly, to a certain extent.

Dr. HILL. Yes.

Mr. HOLIFIELD. Do you believe there can be an effective civilian defense based on the voluntary participation of local geographical and political units?

Dr. HILL. Not without very strong leadership from the Federal Government.

Mr. HOLIFIELD. Do you believe that civil defense can be planned on a one city local basis?

Dr. HILL. About half of it, and the other half just can't be even on a State basis.

Mr. HOLIFIELD. Do you believe that our civil defense planning must be on the basis of a thermonuclear target area or region?

Dr. HILL. If I understand that; yes.

Mr. HOLIFIELD. This is an important question, I believe.

Dr. HILL. You mean in the context of the enemy possibly using thermonuclear bombs? Absolutely.

Mr. HOLIFIELD. Let me rephrase my question in order that the record may be very clear.

Testimony from Dr. Libby yesterday before this committee was that a thermonuclear explosion in the magnitude of a 10-megaton bomb would, according to conditions, spread radioactivity in differences of degrees for 7,000 square miles. He used an assumption that a 10-megaton bomb could spread radioactivity over an area of 100,000 square miles.

This doesn't necessarily mean that it would be lethal over 100,000 square miles. But he gave as a comparison the actual explosion of the 1954 thermonuclear weapon, which did contaminate an area of 7,000 square miles.

In view of that testimony from an unimpeachable source, and, in view of the facts that have already been established by that explosion, can civilian defense any longer be confined to small areas such as most political subdivisions are—the city of New York, the city of Chicago,

the city of Detroit, the county of Cook, the county of Los Angeles, or other local political subdivisions?

Dr. HILL. I think it is completely impossible. As I say, I think you can do half the job at the local level, but——

Mr. HOLIFIELD. We are not ruling out local cooperation and local assistance and local coordination of planning. I am asking you about the overall-target-area planning.

Dr. HILL. No; I think it must come from central headquarters.

Mr. HOLIFIELD. Then, in view of the fact that some of these target areas do overlap cities, counties, and even States, does it not seem reasonable that the Federal Government is the responsible entity for master planning for target areas?

Dr. HILL. Yes, sir.

Mr. HOLIFIELD. I believe that your East River Project Review Report of 1955 recommended that 14 of these target areas—each consisting of a metropolitan area of a million population or more—be given consideration for test planning in those areas.

You subscribe to that recommendation, I suppose?

Dr. HILL. Let me qualify this one. As I read it, we propose 14 metropolitan target areas for study, and study in view of the problem, not as individual entities.

Mr. HOLIFIELD. I know you were not specific in indicating which area.

Dr. HILL. But I mean there shouldn't be one study of, say, New York, and one of Chicago, but they should be integrated as a part of the study of the national problem.

Mr. HOLIFIELD. The military have classified 14 areas, I believe, in the United States, as primary target areas.

You have advocated a test-planning program on 14.

Mr. BALWAN. Fourteen cities they have classified rather than target areas, isn't it?

Mr. HOLIFIELD. No; they are target areas with metropolitan cities as the center of over a million people, as I remember.

This is found in the 1955 review of the report of the project East River. Recommendation B on page 19:

> That the following steps be taken to plan, organize and operate nonmilitary defense on a metropolitan target-zone basis. As a first step, the Federal Government through the Federal Civil Defense Administration finance a study in preparation of a nonmilitary defense plan for each of the leading 14 metropolitan target zones designated by the Federal Government; the Federal Civil Defense Administration designate a Federal representative with an appropriate staff for each of the 14 metropolitan target zones to be studied initially; the governor of each of the States and the mayor of each of the principal cities in each metropolitan target zone designate a representative, probably the State and local civil defense directors concerned, to serve on this nonmilitary defense ad hoc committee.
>
> Likewise, that the Defense Department designate a member; the Federal Defense Administration allocate each committee a sum not to exceed $100,000 for each target zone; and that a period of 9 months be allotted for the preparation of the 1957 nonmilitary defense plans for each of the 14 leading metropolitan target zones.
>
> In the preparation of these nonmilitary defense plans, the assumption be made that for the carrying out of these plans there will be a sharing of the costs as indicated in the budget annexed to the plan by the local and State governments involved, and by the Federal Government. Thus these plans will have to be approved by the mayors and governors concerned, and also by the Federal Government.

Until these nonmilitary defense plans for each metropolitan target zone are formulated and priced up in terms of annual operational costs, it is difficult to recommend a precise formula for cost sharing. Greater participation in cost sharing by the Federal Government is urged, but this requires congressional action which cannot very well be taken until a number of the plans are available for scrutiny.

Now it goes ahead and I think this is important enough to read:

As a suggested pattern, the nonmilitary defense plan for each of the metropolitan target zones be developed on the basis that the local civil defense organization is the first line of defense, the State civil defense organization will provide the support forces, and the Federal target zone chairman will control the employment of support from both inside and outside the metropolitan target zone, and may be needed to assist the local and State civil defense forces that have been committed.

It goes on into more detail. You are aware of those recommendations?

Dr. HILL. Yes, sir.

Mr. HOLIFIELD. You approve of those, do you, as a matter of your personal judgment?

Dr. HILL. May I back up just a little here? This group of recommendations created a lot of discussion, as you might expect. My own personal feeling would be to sharpen it up a bit and put more of the burden on the Federal Government, and if this requires congressional action, ask for congressional action.

Mr. HOLIFIELD. We are asking you for your judgment, and we hope that your position as an adviser to the Defense Department will not embarrass you to the point where you won't be frank with this committee and give us your best judgment, because that is why we have you here.

Dr. HILL. I will be as frank as I can be.

Mr. HOLIFIELD. Thank you.

Dr. HILL. I would personally prefer to see that a little stronger and make for a more centralized planning unit. These 14 ad hoc committees—you know some will be good and some will be poor, and there will be some in between, and they will argue. It would be much better, I think, if there were centralized leadership of this.

But in the desire to get on with the job, I subscribed to this as a starting point. I think it should be carried a lot further.

Mr. HOLIFIELD. In other words, this is a test plan which has been offered. As far as you know, no such operation has been conducted to this date by the Federal Civil Defense Administration?

Dr. HILL. Not that I know of.

Mr. HOLIFIELD. In fact, they don't have the authority to do it; do they?

Dr. HILL. No, sir.

Mr. HOLIFIELD. Under the act, Mr. Peterson does not have the authority to do just this thing?

Dr. HILL. That is right.

Mr. HOLIFIELD. And he probably doesn't have the money. I am not sure about that. In this $85 million, there may be enough in planning that $100,000 could be diverted to 14 target zones from the standpoint of making a test.

The point I am trying to make is, we have got to get on with this job. Something has got to be done. We have got 65 million or 75

million persons subject to annihilation in one night as is possible at this time.

You and I know that the defense capabilities of this country cannot prevent that many planes getting through with that many bombs. This is the problem we are faced with. We are serious about this matter.

Dr. HILL. I think it is a good recommendation as far as it goes, but it doesn't go far enough. If this is all we can do, let's get on with this. But if we can do more, let's do it.

Mr. HOLIFIELD. Thank you. Have you had a chance to look at the two bills that we have referred to—Mr. Riehlman's bill, which advocates integration in the Department of Defense of a civilian defense agency, and my bill—and believe me when I say this, that Mr. Riehlman and I are both openminded on this. There is no antagonism between us on it, or even opposition.

We both have thrown these bills in without specifically championing either one of them, but from the standpoint of presenting two facets to the Congress, first, that the Civil Defense Agency be retained as an individual entity—that it be elevated to Cabinet status. The other bill, Mr. Riehlman's bill, that it be given a prominent place in the Department of Defense, and integrated completely with the Department of Defense.

Would you care to testify from your judgment, now, on the desirability of either one of those principles at this time? I might say that we will have the Defense Department before us, because we know that different people in the Defense Department differ on the subject as to whether this should be an obligation of the Defense Department.

Yet in Operation Alert we saw a mock martial law declared by the President, which would have gone much further than just putting it in the Defense Department. It would have subjected every State, county, and local official to military law.

There was quite an important legal article on this particular point. We are going to have expert testimony, legal testimony, on the meaning of the declaration of martial law, before this committee concludes.

So back to my question of these two principles: Would you care to comment on it at this time?

Dr. HILL. I am not trying to be diplomatic. I just feel pretty ignorant on how one would set up a new department and make it operational in a short time, which I think it has to be.

Mr. HOLIFIELD. Maybe I have not explained myself. The Federal Civil Defense Administration is already set up. The transforming of it to Cabinet status would not be setting up a new department. It would be giving it a new dignity or a new prestige—a new strength in our National Security Council.

I believe you have recommendations in your East River project that are along that general line, that they have a place on the Security Council and so forth.

Dr. HILL. I think their needs and their problems must be brought before the National Security Council. Whether this should be done by a man of Cabinet rank or by the Administrator or by the Department of Defense, I don't know.

Here I would have to ask a question: Isn't the key to this one very much in whether we are going to declare martial law if a bomb drops?

Mr. HOLIFIELD. Not the key to the two legislative proposals. I don't think that would have a basic effect on them. We could elevate the Federal Civil Defense Administration to Cabinet status and it could operate as an executive arm of the Government on legislative authorization to coordinate planning, let us say, and help finance planning in a target area zone without the declaration of martial law.

If it was placed in the Department of Defense with prescribed duties and responsibilities by the Congress, it could operate without martial law. Under both conditions, martial law could be declared and it could operate under martial law also.

So I don't think we have to make the decision now whether it will be declared, or whether it should be declared. I think it is a matter of organization of the Department of Defense from the standpoint of its effectiveness with the American people, and its authority to do the job which this committee feels needs to be done.

Mr. FASCELL. Maybe I misunderstood Dr. Hill, but I thought that was the very point he was questioning. In other words, if you have a hypothetical case where martial law has been declared, maybe it would be better to plan all along that you would integrate your whole civil defense from a military standpoint.

Mr. HOLIFIELD. But the only thing we have to go by is the President's action on Operation Alert, which was supposed to be a test of our civil defense operation.

Dr. HILL. I think the business of planning civil defense is certainly something that an agency which does not have the same responsibilities of the Department of Defense ought to do. I think this could be done in the Department of Defense unless they get into budgetary troubles. Then you know how it is.

They are going to support those problems they feel are most important. If a good planning job is done by Civil Defense Administration wherever it exists, I think the local military have to be brought into the picture from the start because there are a good many military people stationed in many of our cities. These are one of the few forces under discipline that can be told to do jobs in a given emergency.

Mr. HOLIFIELD. Are you speaking of the active military force or the National Guard and Reserves.

Dr. HILL. Both. But they are subject to a discipline which can be imposed, with or without a declaration of martial law. So I think it very important that these people come in and be made a part of the civil defense planning and so on, because in the case of a disaster, they are going to be along with policemen and firemen and so on. Sort of the first line.

Volunteers may disappear. They can always disappear on the basis that they have their wives and families to take care of.

Mr. HOLIFIELD. Maybe some are sunshine soldiers, as Thomas Paine called them.

Dr. HILL. I just don't know enough about government organization to comment on the relative merits of the two bills. The one danger I would see in Mr. Riehlman's is that the Department of Defense is already overburdened with jobs. Maybe they don't want another one.

To be perfectly bipartisan or nonpartisan, I should add, I do feel that in changing an agency to a department, there are administrative problems which I don't understand.

Mr. HOLIFIELD. I want to give Mr. Riehlman a chance, because his name has been used here, and his bill, indiscriminately. In general, you would approve of the idea of giving the Federal civil-defense agency more prestige and more authority?

Dr. HILL. Yes, sir, and more money, I think.

Mr. HOLIFIELD. And more money? I am sure they will be glad to hear that last.

Mr. RIEHLMAN. Doctor, not to argue the point, but my bill establishes a Civil Defense Director in the Department of Defense with the same status that the Secretaries of the Army, Navy, and Air Force have, purely on the basis of being constantly informed of what is going on in our Civil Defense Department.

You made the statement a moment ago that is very important, that is, that if we are going to integrate a program down to the civilian level, we must have people at the top properly informed at all times as to what is going on.

I noticed in the East River report there is great stress put on this point, that it is so important to keep the Federal civil defense abreast of the information that is flowing from the National Security Council into the Department of Defense all the time, and particularly with respect to the evaluation of new weapons and the concept that you have of them.

It states in the report that you signed that if we go through the normal procedures we are following today, and no information is getting to the Director of Federal Civil Defense until after the announcement of the new type of weapon, he will be lagging from 2 to 3 years behind in his preparation for civilian defense, and therefore he should be apprised by such information the moment that it is available to the Department of Defense so that his program and his announcement of civilian defense can be made at the same time our national defense program is announced.

Dr. HILL. I agree completely.

Mr. RIEHLMAN. Not that I am arguing for my bill. I am arguing for this, that somewhere along the line in this setup we must have a close liaison between all levels of our Defense Department with our civilian defense, if we are going to keep abreast with the need and with the program that we must have to protect our people and our industries.

We know that in the Department of Defense in an area where the Navy has an installation, it has its responsibility to protect it—and that applies to the Army and the Air Force, too. So we would have in that case an overlapping of activity, too.

So if we had an integrated program where, if you could call him a Secretary or whatever title you want to give him, he has this information all the time, I think we would find that our people would be better informed and be in a position to accept the responsibility that we are going to call upon them to accept in case of an emergency.

It is so realistic, this is the approach we have to take.

Dr. HILL. Could I just quickly add, I agree completely with your statement and that of the chairman, about what these bills are trying to accomplish. I could not agree more.

I just do not feel qualified to say this, or that, is the right method of accomplishment. But the business of keeping the Civil Defense Director informed is very important.

Mr. RIEHLMAN. Mr. Chairman, if I might interrupt at that point, I want to concur, too, in what the chairman said. We have no desire to force upon the administration or the Congress any of our personal ideas. We have introduced these bills with the hope and the thought that we might get constructive suggestions from our people across the Nation and people like yourself who are in key positions, to try and bring to the Congress a very strong report as to what needs to be done in this Federal civil-defense program.

Mr. HOLIFIELD. Mr. Fascell?

Mr. FASCELL. I just wanted to ask the doctor if in arriving at a conclusion in this matter, is it not true that you would have to make a very careful analysis of the nonmilitary purposes of civilian defense as against the military purposes of civilian defense?

Dr. HILL. As I understand civilian defense, I do not think there would be a need to worry about whether the military gets something out of it or the civilian populace gets something out of it.

Mr. FASCELL. That is not what I had in mind exactly. In other words, what military purpose is served by civilian defense—manufacturing effort, offensive capability?

Dr. HILL. I think the whole problem of logistics and supply and the civilian understructure for the military are all helped, and in that sense this is a military property. But I think in the broad sense you can't distinguish.

Mr. FASCELL. I agree thoroughly with your original statement, that it is impossible to separate them. But the question I am asking is that in trying to decide the manner in which this problem ought to be handled in the future, since we are all agreed that the present system is inadequate, should we not consider carefully and give appropriate weight to the purposes, both military and nonmilitary, before we decide that one should have a Cabinet status, or he should be integrated into the Department of Defense on a civilian basis, or whether it ought to be completely military.

Dr. HILL. I think the answer is "Yes."

Mr. HOLIFIELD. Mrs. Griffiths, do you have a question?

Mrs. GRIFFITHS. I have no questions.

Mr. HOLIFIELD. Mr. Lipscomb?

Mr. LIPSCOMB. Dr. Hill, have you ever given any thought to what you believe would be an adequate amount of money to be appropriated to civil defense?

Dr. HILL. The answer is "Yes." This was about 3 or 4 years ago. I do not believe my evaluation then was very good. Things have changed.

I think this will have to come out of a real bona fide study, full time, for several months on the part of a number of knowledgable people in the field. You recall, the review of the East River report was a sort of a part-time activity—that is, a day, a week, or less, on the part of many of the people.

I think probably what is needed is something similar to the original East River study in attempting to tie dollar signs and direct thinking along these lines. I regard the establishment of these 14 committees

as a start in that direction—not the ideal one, but one that seems possible under the existing law.

Mr. LIPSCOMB. At the present time there is no need of appropriating more money until they have a program to use the money on.

Dr. HILL. You might want to appropriate enough money to get the program. That is a study sort of thing.

Mr. LIPSCOMB. Of course, all of the money that we are appropriating for civilian defense is not going to the Civilian Defense Agency. Many of the dollars that the Defense Department is spending is for civilian defense in the warning systems and other things.

So you recommend that the first thing that we have to do is to reevaluate the program along the lines of the East River project?

Dr. HILL. Yes.

Mr. HOLIFIELD. You have no major differences with the recommendations in the East River project?

Dr. HILL. No, sir. I was just pointing out that the recent review is a part-time thing to try to sharpen up what East River had thought, in view of weapons several years later. But to put a dollar sign to it would take some real planning, and I would say a staff of maybe 15 people for several months.

Mr. LIPSCOMB. Do I understand also that you feel there should be an even more comprehensive study by a full-time committee similar to that of project East River instigated?

Dr. HILL. To sharpen up the dollar sign. A lot of the East River report is still perfectly valid.

Mr. LIPSCOMB. In other words, all the information for an adequate civilian-defense program you feel is in those two reports, the first and second East River reports.

Now it is just for Congress to implement the legislation or pass additional legislation, whichever is necessary, and get the thing rolling.

Dr. HILL. I think that is correct.

Mr. HOLIFIELD. Here is my plan, I will say to the members of the subcommittee.

Mr. Kilgore has 1 or 2 questions. Then we would like to go into executive session for possibly 15 or 20 minutes with Dr. Hill.

Then if we have to go to the floor at that time we will cut that short, or if the bells do not ring, we can go on a few minutes later.

If that is satisfactory, we will ask Mr. Kilgore now if he has something he wishes to clarify on the record.

Mr. KILGORE. Doctor, back to the matter of early warning. As to the function of various aspects of early warning, it would generally be true, would it not, that when the farthest outlying portion of the network picked up what we presume would be enemy aircraft, and assuming that it comes from the Alaska area, virtually all targets, at least in the northern United States, would have to then be alerted.

From that point on the matter of tracking and the matter of control is one of a more definitive alert and the matter then of the exercise of whatever defensive procedures are going to be used.

Assuming also, as I think we should——

Mr. HOLIFIELD. Just a minute.

Dr. Hill, will you please answer vocally. The nod if not recorded on the record.

Dr. HILL. I have been saying yes right along.

Mr. KILGORE. I imagine we would have to asume also that we would use whatever defensive methods or techniques there may be. Such detection devices comparable to the use of an antiradar device in World War II would be used. We would also have to assume that there would be low level approaches.

There again you get into the question of the efficiency of jet engines and that sort of thing. But once the capacity to reach the target is achieved, and that point is reached, I think we would have to assume that there would be some low level approach and that there would be some of what we call the Kamikaze activity at this point.

Then to fit it into that picture, I wanted our record to reflect what I think was your testimony in connection with the use of the ground observer, that some airplanes perhaps with the use of jamming devices may come through the screen. Of those that come through detected, there are still airplanes that would drop to a low level, we will have to assume, and come on in.

There would still be the matter of pinpointing, actually with the existence of vapor trails and that sort of thing. It would be in that aspect that there is now not anything which would make the abolition of the Ground Observer Corps at all essential, but rather their use is pretty well pointed up in tying together that information.

Dr. HILL. Yes, sir.

Could I just comment here. Remember, I said I know nothing about how the Ground Observer Corps is operated. So if they are doing all the wrong things, or all the right things, I am not commenting on that.

I think there is a use for the Ground Observer Corps. But it should be a proper one and not the bird watching use.

Mr. HOLIFIELD. Thank you very much.

I see some interest has been aroused. Go ahead, Mrs. Griffiths.

Mrs. GRIFFITHS. I was struck by the statement of Mr. Fascell a few minutes ago that the Civilian Defense would operate to assist the Army—the military. Isn't that a quite optimistic view? If you had 70 million people killed in one attack, as the Chairman suggested, Civilian Defense's only purpose would be to try to maintain life.

Isn't that right?

Dr. HILL. That is correct.

Mrs. GRIFFITHS. Under those circumstances, then should not this Civilian Defense be geared to that idea, simply to maintain human life on this continent?

Dr. HILL. I think that is correct. I should like to amplify my earlier statement.

The civilian people of this country support the military. The military do not run their own farms and factories.

Mrs. GRIFFITHS. Right.

Dr. HILL. I said in that sense if we can keep those things going, we are also doing a job for the military.

Mrs. GRIFFITHS. Right.

Dr. HILL. There is another point. You said 70 million. It might be only 5 million. Then it is a different thing.

Mrs. GRIFFITHS. That is right. But under the worst possible view, the sole purpose of Civilian Defense is really just to keep these people alive.

Dr. HILL. That's right.

Mrs. GRIFFITHS. Just to keep some of them alive.

Mr. HOLIFIELD. I want to clarify my statement that when I used the term, it was 70 million, I used it on the basis of a completely unprepared population taken by surprise attack, without an adequate civil-defense protection. That was what I would like to have that figure show on the record.

Mrs. GRIFFITHS. I would like to say again that it seems to me under these circumstances, if ever, the time has passed when civilian defense should be subordinate to the military. The military should never be permitted to plan on the basis of "We are saving these civilians to save the Army to make another attack or to defend."

They should never be in a position where they can say "We will cut off another $100 million here and put it on jet engines." There should be somebody who is going to speak for the civilian population.

Dr. HILL. Isn't that the purpose you are examining, to strengthen the Civil Defense Agency, by whatever means is proper?

Mr. FASCELL. To clarify the discussion, I hope, do you or do you not envision under conditions in which this country finds itself today, that an attack which is basically against the civilian population as such, because it has to sustain the military effort, without direction from the standpoint of defense strategy or even offense strategy, might be a direct impediment to doing what we are trying to do?

Mr. HOLIFIELD. In a military way.

Mr. FASCELL. In a military way. In other words, that gets back to the original thought that you had, which is that you cannot separate civilian defense and military defense.

Dr. HILL. I think that is right. But there are certain things the military are not supposed to do, as I understand the law, and certain things the civilian people have to do. And in this planning stage, there has to be a civil defense agency.

Mr. FASCELL. Right. That gets back to another question that I asked, which is: Do we not have to evaluate carefully the nonmilitary purposes of civilian defense and the military purposes of civilian defense to determine what aspects of each might be under an integrated program—what aspects might be completely civilian, what aspects must be completely military?

Dr. HILL. Isn't that in part a matter of definition?

Mr. FASCELL. Yes; definitely.

Mr. HOLIFIELD. But it is also a matter of research and findings and conclusions.

Dr. HILL. That is right. These definitions have to be made.

Mr. HOLIFIELD. And I think one clear line ought to be drawn at this point, that any civilian defense effort, as the East River project has recommended, requires a clear coordination between military units under strict military discipline and civilian units under civilian authorities, and therefore unless you have martial law, you could not place the civilians under the same rigid command—rigid military type of discipline.

Therefore the argument could well be made that it might be a case of coordination, rather than integration under the military discipline.

We are pressing on time.

Mr. FASCELL. I had just one question.

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You brought up this early warning thing, Doctor. The American people are spending millions and millions of dollars to gain time by setting up a complete periphery of an early warning system. We gain that time by extending ourselves on the ground.

Now, what I am wondering about: Is it not true that before we get this thing completed to where it reaches maximum efficiency, it will already be obsolete because we will be able to obtain warning systems without going on the ground to gain distance, when as a matter of fact we can do it right from our own country?

Dr. HILL. You mean by using airplanes?

Mr. FASCELL. I do not know. I do not mean that. But is it not true that science can obtain the same information by going vertically without going out——

Dr. HILL. Not against aircraft.

Mr. FASCELL. For detection?

Dr. HILL. No, sir; not against aircraft.

Mr. FASCELL. There is a scientific limitation that I do not comprehend——

Dr. HILL. The earth curves and radar and light travel in a straight line.

Mr. FASCELL. That is what I am getting at. If you have got a point on the curvature of the earth, you have to keep going out to get over the curvature.

But if you are in the air, you can take in all of one-half; can't you?

Dr. HILL. If you want to see 2,000 miles, you would probably have to be about——

Mr. FASCELL. I am not talking about visual detection now.

Dr. HILL. The only detection we know that will do this sort of thing is line of sight. So to see 2,000 miles, you would have to go up 400 or 500 miles.

Mr. HOLIFIELD. The era of the practical satellite is not here for that purpose?

Dr. HILL. The practical satellite to do this would be about as big as the Pentagon. I am not proposing any disposal of public buildings.

Mr. HOLIFIELD. Does the committee feel that we should ask the doctor back for a short afternoon session, or can we go now into executive session and have about 15 minutes discussion with him and terminate his testimony at this point?

For the public record, Dr. Hill, I wish to say that we appreciate very much your appearance here this morning and the frankness with which you have answered our questions, and the testimony which you have given to us. We will consider it very carefully.

Dr. HILL. Thank you very much, Mr. Chairman. It has been an honor to be here and to do anything I can to help you.

Mr. HOLIFIELD. We might call on you again for some specific answers to specific questions if we may feel free to do so.

Dr. HILL. I will be delighted to come.

Mr. HOLIFIELD. Thank you very much.

The committee will be in executive session with Dr. Hill.

(Whereupon, at 12:05 p. m., the subcommittee went into executive session.)

CIVIL DEFENSE FOR NATIONAL SURVIVAL

TUESDAY, FEBRUARY 7, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS OF THE
COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met, pursuant to call, at 10:05 a. m., in New House Office Building, room 1501, Hon. Chet Holifield (chairman of the subcommittee) presiding.

Members present: Representatives Holifield, Kilgore, Fascell, Griffiths, Riehlman, and Lipscomb.

Also present: Michael P. Balwan, staff director; Herbert Roback, director of investigations; James Eckhart, assistant counsel; Earl Morgan, staff member; Robert McElroy, staff member; and Carey Brewer, Legislative Reference Service, Library of Congress.

Mr. HOLIFIELD. The subcommittee will be in order.

This morning the subcommittee is honored to have Dr. Lloyd Berkner, president of Associated Universities, Inc., which is an association of the northern universities in the United States. This group operated the project, East River study in 1952 and the 1955 review of that study. It operates the Brookhaven National Laboratory for the AEC on a permanent basis. Dr. Berkner has long been associated with the national-defense program. He organized the Associated Universities specifically for the purpose of making university resources more readily available to the Government for defense purposes. He was a member of the original East River group 1952 and also served on the 1955 review committee which studied the findings and recommendations of the East River report in the light of subsequent developments.

The East River report, 3 of the 10 volumes being classified, laid the foundation for our present continental-defense program and made recommendations as to how the Government should proceed in developing an effective civil-defense program.

Dr. Berkner, the purpose of this committee is to study thoroughly this problem which we feel is so vital to the overall defense of our Nation. The chairman of the full Committee on Government Operations has assigned to this committee several bills; I hope those bills have been brought to your attention. Some of the bills go on the theory that the Federal Civil Defense Administration is lacking in prestige and effectiveness and proper type of legislation, proper type of financial support, and does not at this time have as important a part in our overall national defense as the authors of those bills think it should have, and those bills seek to elevate the Federal Civil Defense Administration to Cabinet position, allowing the head of

that organization to sit in with the National Security Council in order that he may know thoroughly, currently, and completely the problems of offense and defense from a military standpoint.

Another purpose of a reorganization plan type of bill which is before us is the location of the Federal Civil Defense Agency within the Department of Defense. We expect, of course, to explore both of these purposes of legislation thoroughly.

We wish to find out what authorities in the field and well-informed persons think about this legislation, and the military department will be given opportunity, of course, to give us a complete set of information on their attitude toward either accepting civil defense as a fourth arm, you might say, of the total defense or whether they believe that it should be built on a different basis outside of the Federal Civil Defense Administration.

Also we found during the last tests of the FCDA that mock martial law was declared by the President. This brings up a whole field of exploration which seems to be of concern to a lot of important people.

This committee takes no position for or against the declaration of martial law. We do feel, however, if martial law is part of the plan which might be necessary or which might be thought to be necessary in case of enemy attack on a full-scale basis, that this should be explored at this time and the extent of the effect of this declaration should be understood by the Congress, should be understood also by the governors and other State officials that will be subject to subordination or possibly integration and at least coordination with such a declaration. And so, as we get into this study, we are planning to study these different fields.

We know that you are qualified, certainly that you have possibly one of the best backgrounds of any of our scientists, and; without trying to tell you the type of testimony which you should give, I am giving you this background of our objectives and our hopes of building up a thoroughly documented, complete study on this subject.

Now, sir, I see you have a prepared statement. Would you like to give that and then subject yourself to questioning?

STATEMENT OF DR. LLOYD V. BERKNER, PRESIDENT OF ASSOCIATED UNIVERSITIES, INC., AND MEMBER OF PROJECT EAST RIVER, CONCERNING CIVIL DEFENSE

Dr. BERKNER. Thank you, Mr. Chairman. I was very happy to respond to your invitation to be present today because of our common interest, I believe, in the whole problem of civil and nonmilitary defense.

In accordance with the suggestions of your orginal letter of invitation I prepared a short statement of six pages directed primarily to the questions raised concerning the present bills. With your permission I should like to read this statement and then I shall be happy to respond to the best of my ability to any questions you may have concerning the broader problem.

Mr. HOLIFIELD. Fine.

Dr. BERKNER. The problem of creating an adequate civil or, more properly, nonmilitary defense is of concern to every citizen. It is not simply a question of saving lives, or of reducing damage, or of

retaining ability to fight back after war is here. By remaining an easy and inviting target, we encourage an uncompromising enemy to believe that war against us is an easy and feasible way to succeed in his objectives.

A sound and effective nonmilitary defense coupled with adequate military power serves as the only real deterrent to war during our present troubled times. But to achieve this security, we must leave no delusion in the mind of an enemy that our civil and industrial power could be neutralized by a few swift blows of modern weapons.

In fact, with near balance of military power, the Nation with the strongest nonmilitary defense of its people and facilities may well control the situation.

Our Nation has moved with great wisdom in the creation of continental defenses. As little as 4 years ago, the problem of civil defense appeared entirely unmanageable, since no effective defenses lay between ourselves and an enemy. We could then be destroyed with an impunity that no civil defense could correct. But in 1952, this terrible weakness was recognized and the means of correction were found.

By late 1953 the basic organization and plans were perfected and the continental air defense was organized. Now, while these defenses-in-depth are far from complete, our military protection is growing daily. Consequently, the effectiveness of the nonmilitary defense can now be visualized in a measurable way.

We can no longer be destroyed at will. The enemy must launch a mighty force to succeed in the delivery of the two or three hundred bombs of megaton size on the targets that might immobilize us.

The job of nonmilitary defense is to increase the number of bombs that an enemy must deliver to damage us mortally, so that no enemy can imagine that any mass or a surprise attack within his capability can put us out of the running.

This can be achieved, and when it is, the dangers of atomic war against our population are greatly diminished. Thus, nonmilitary defense plays a vital role in the prevention of an all-out war.

Quite aside from its effectiveness in maintaining our strength in time of war, it is a form of insurance against war in time of peace.

We must also recognize the substantial steps that have been made toward a more adequate civil defense over the past 4 years. Now substantial stockpiles of medical and hospital equipment have come into being where none existed before.

Disaster communications are immeasurably better. A "feel" for the evacuation problem is being developed. The warning network is being perfected. We have become aware of the great problems of undertaking adequate nonmilitary measures for metropolitan protection. These are but a few of the gains that have been achieved by our civil defense effort.

But it would be ridiculous to paint a bright picture, for we are far from creating an effective nonmilitary defense.

Let me say at the outset, that I agree fully with the recommendations of the Project East River Review Committee, under the chairmanship of Maj. Gen. Otto L. Nelson, that has just reported to the Government. But before I turn to the question of organization of nonmilitary defense, let me discuss some of the critical problems of such defense.

In this discussion, I cannot pose as an expert, but I doubt whether there are any real experts on nonmilitary defense against present-day weapons. I can only speak as a citizen with scientific training, who has given the matter a good deal of thought and study in light of some knowledge of present-day weapons.

To me, the most critical problem is that of maintaining our industrial effectiveness after an attack. Of course, the loss of cities and their populations is a most serious matter, but the "jackpot" question is: "Can we continue to function industrially as a nation to support our Armed Forces and our remaining population after the loss of many cities?"

In asking this quesiton, we must remember that we have at least three times the industrial capacity of our nearest competitor, and that even if we lost half of it would still remain ahead of him, provided the remainder was a *balanced* capacity.

There are three major aspects to this question:

First, after the loss of many cities, do we retain a balanced, though reduced, industrial capacity that lies outside the 175 to 200 principal metropolitan target areas? By balanced, I mean industries basic to both military and civilian activities, that are mutually required for a continuing and effective industrial activity. I include not just basic arms ndustries, but food processing plants, spinning mills, clothing factories, and the like. Certainly this question is open to survey and study. It is likely that not much new and additional plant capacity outside the target areas must be added to that already safely located to retain as much as 30 or 40 or even 50 percent of our total balanced capacity, even if our 200 main metropolitan areas were destroyed. But nonmilitary defense should ascertain what plant capacity is now lacking from safe locations to maintain this industrial balance at an adequate level outside the main target areas, and to encourage its construction as a matter of priority.

Second, with the destruction of the main target areas, will we retain the links of communication and transportation essential to the maintenance of a reduced but viable industry?

Third, will we retain sufficient skill in our resources of labor and of engineering and scientific personnel, or what added trainiug programs or protective measures are necessary?

The solution to these problems of nonmilitary defense involves the whole of our economy from the Federal, through the State, county, city, and even village levels.

A second critical problem is that of civil defense in event of attack. This is primarily a metropolitan problem with related aspects of mutual support from surrounding areas. One needs only to read Hiroshima Diary to realize that city and State lines must be subordinated in the solution of this problem. Civil defense must be organized on a metropolitan area basis, with full recognition of the political problems in crossing the city and State lines that are introduced as a consequence.

Nevertheless, a few great port authorities have succeeded in establishing authority across political boundaries where the need is great. Here the wise cooperation of Federal, State, and city authorities is essential to the creation of the mechanisms of organization that are imperative.

These kinds of problems, and the others involved in nonmilitary defense, are essentially civilian in character. They involve every element of government and of the individual citizen and his personal interests in a large measure.

If I may oversimplify, nonmilitary defense is simply the extension of normal functions of government, industry, commerce, and the individual to the unusual conditions of present-day all-out war.

The purpose of such a defense is to reduce our losses and to maintain a viable war economy. It is everybody's job, and for this we must employ a diversity of government and private functions by the same mechanisms with which we have become familiar during peace.

Therefore, I oppose organization of nonmilitary defense as an arm of the Defense Department.

Specifically, this conclusion rests on the following grounds:

1. The military forces have the job of successfully fighting the war when it starts. This must be an unambiguous responsibility. They must not be diverted to secondary tasks that would inevitably expose them to the tremendous force of public clamor that might divert a great share of their power to civil defense after a devastating attack.

2. The military forces, as an essential element of national strength, must lean on an effective civilian national industrial economy, either in peace or war. It is the job of the people and their government to see that this support is provided. In a republic, the people have no right to expect the military forces to undertake the task for them, even in time of war.

3. The job of nonmilitary defense relates to the lives of our whole citizenry and involves their interests, privileges, and problems. Consequently, the solution of the problem involves the interaction of intricate political elements. The military organization is not trained to deal with these political forces, and in a democratic system should not become involved in them. Were they to become involved, great damage and disrepute would come to our Armed Forces. Such damage would adversely reflect on their capabilities as a fighting force.

4. The Federal Government, the States, the metropolitan regions, their supporting areas, and each citizen has a part to play in nonmilitary defense. Delegation of the responsibility to the Defense Department would falsely relieve them of a responsibility that they must actually be prepared to assume.

However welcome, the idea that "The Army will take care of us" is dangerously unrealistic and should be avoided. In the event of devastating attack, no military force could possibly cope with the situation; it could only add whatever resources that they could spare on the spot. We must realize that we cannot cope with nonmilitary defense on a professional military basis—there are not enough people nor enough dollars. Nonmilitary defense must be based on utilization of millions of people having comparable civil training and experience in tasks suited to their competence.

5. The function of command and direction in the Department of Defense would be weakend by the addition of responsibility for nonmilitary defense. The present structure of the Department of Defense is very large and complex, and during war the Secretary of Defense and the Joint Chiefs of Staff will be overburdened by the task of effective military prosecution of the war. If we add nonmilitary defense, they would acquire most of the responsibility of the President

in time of war. On the other hand, with nonmilitary defense directly under the authority of the President, he can administer it with the whole force of the regular Government organization through a properly organized department of nonmilitary defense or its equivalent.

My belief that nonmilitary defense should not be organized under the Defense Department does not suggest that it should be relegated to its present second-class role. On the contrary, the proposal that it be placed at Cabinet level seems to have much merit. Basically, the head of nonmilitary defense must have two major responsibilities:

1. The maintenance of a workable economy with the relatively undamaged portion of our industry after a devastating attack.

2. The reduction of damage to, and rehabilitation of, our population, communications, transportation, and industry in "blitzed" metropolitan areas.

The first responsibility, namely the maintenance of a workable post-attack economy, requires careful planning and authority to make attractive the location of essential elements of industry and population outside target areas in advance of the attack, augmented by modifications to communications and transportation systems, and training of manpower under stimuli and conditions that the Congress can provide.

It further requires mobilization of communications, transportation, and skilled manpower after the attack in accordance with plans. The objective is to maintain a workable and balanced, though reduced, industrial and economic strength. This is almost wholly a Federal responsibility to be carried out in consultation with local authorities.

The second responsibility, for reduction of damage and rehabilitation, involves planned protective measures, training of large numbers of specialists, and their organization and drilling in operations that they may face only once in their lives. This is primarily a metropolitan responsibility with Federal responsibility for—

(*a*) Assistance, through provision of specialized knowledge, in organization of metropolitan regions coupled with the necessary mobile support in depth. Here the Federal Government must provide the leadership in catalyzing metropolitan-area civil-defense integration to effectuate its overall responsibilities for the "common defense."

(*b*) Uniform training and training standards for specialists of the various cadres that are essential.

(*c*) Uniform and adequate standards for equipment based on weapon potentialities.

(*d*) Assistance through specialized knowledge in organizing operations, and standardization of operations where feasible.

(*e*) Provision of warnings of appropriate and uniform character.

(*f*) Establishment of Federal standards for performance with incentives and rewards for achievement.

(*g*) Mobilizing support across State lines where not included in metropolitan areas, and stockpiling specialized supplies for use at any of a number of centers.

(*h*) Conduct of research leading to improved equipment, training and operations.

(*i*) Provision for public information.

Both responsibilities involve staff planning, widespread training with specialized educational facilities, and operations. They seem to me to represent responsibilities of importance to our citizens that are equal to those of several other existing Government departments.

Moreover, both to the maintenance of peace, and to the waging of war, the responsibilities seem such as to require a voice, and a share, in responsibility at the top level of Government.

Therefore, I would favor creation of a Department of Nonmilitary Defense at the top level of Government. It should be organized with both staff and operating functions to discharge the responsibilities that I have outlined. Moreover, its staff should be augmented by authoritative and responsible representatives of other Federal agencies that must play a part in the creation of nonmilitary defense. Finally, it should control all funds essential to its responsibilities, even if these are discharged through the offices of other agencies.

In conclusion, may I reiterate that we have made great strides in avoiding surprise by creation of our continental defense-in-depth in combination with our continental and overseas bases.

For an enemy cannot strike both continental bases and overseas bases simultaneously without giving us prior warning upon crossing our continental extremities. With warning, terrible retaliation is certain. If now, we create a significant balanced economy outside an enemy's destructive capability, the deterrent effect of our retaliatory force is tremendously enhanced.

For then, no enemy could dream of knocking us out by a simple exchange of blows. Thus, nonmilitary defense may now be perhaps the best and cheapest way of multiplying our military effectiveness with respect to our basic objectives.

The nuclear weapon and its long-range vehicles are here to stay.

Their very power gives us a sense of sober responsibility toward war that has never been so drastically impressed on any earlier generation of men. Our avoidance of devastation lies in our wisdom in making obvious to any potential aggressor that war is the least worthwhile of all alternatives. In this, our nonmilitary posture is an essential part.

Thank you, Mr. Chairman.

Mr. HOLIFIELD. Thank you, Dr. Berker, for that very clear statement which you have made and the position which you have outlined. At this time we will give the members of the committee an opportunity to ask some questions.

Mr. Kilgore?

Mr. KILGORE. I have no questions at this time.

Mr. HOLIFIELD. Mr. Riehlman?

Mr. RIEHLMAN. I have no quarrel with the doctor's presentation here in respect to the establishment of a person in charge of our civil-defense program with Cabinet status. The chairman and I have introduced these two bills both having different ideas and thoughts as to how we might strengthen our civil-defense program. Many of the things you have brought up here are very important and ones that the committee will certainly take under serious consideration.

I had some things marked here, Mr. Chairman. The second paragraph you relate. "Now while these defenses in depths are far from complete our military protection is growing daily."

Could you expand a little bit on the meaning of that statement "are far from being complete" for the committee's edification?

Dr. BERKNER. As I understand the situation, the plans are carefully laid at the present time and it is a matter of completing construction and filling out the planned organization of the defenses in depth.

We all know that major steps have been taken with respect to the close-in defense. We have learned of the Texas Towers. We know the DEW line is proceeding rapidly. We know the North Atlantic Treaty Organization has adopted a resolve to establish a similar warning line in the eastern part of Europe. This was announced at the conclusion of their last meeting.

These are the steps which are underway for which active plans are underway. It is simply a matter of the time required to fulfill these plans.

Mr. RIEHLMAN. Apparently you do not feel that even though we are making progress in that field that we are making sufficient progress in our own planning for civil defense.

Dr. BERKNER. That's correct.

Mr. RIEHLMAN. You have covered your feelings toward the two pieces of legislation. Would you expand a little bit as to your attitude in respect to our lack of planning and programing in civil defense?

Dr. BERKNER. Four years ago when project East River study was proceeding, it was extremely difficult to conceive how an effective civil defense could be created in the absence of the warning and defense in depth which is now planned, but which was not then planned.

The problem was this: Since our metropolitan areas were then open to attack, the power of the enemy's offensive was sufficiently great to almost insure the complete destruction of all of our major facilities. It was difficult to see what could be done to make civil defense really effective in the absence of a more adequate military defense.

Today the picture has changed completely. The executive branch, the military departments, the Congress have all worked together in what I consider to be as superb fashion to bring about a military defense which is rapidly coming to adequacy, which now makes it feasible to think about a civil defense, a nonmilitary defense, which can be a very effective part of our total defensive mechanism.

It is therefore very appropriate that this committee look into this matter at the present time because questions can now be answered in a positive way, for which one could only estimate answers before.

We could only say before that if we had a military defense of a certain quality, then it would be possible to do certain things. These questions are not necessary. We now say that since we will now have an adequate military defense certainly within the time we can do anything about civil defense, we can now proceed confidently in the establishment of an adequate nonmilitary defense.

Mr. RIEHLMAN. I think somewhere in your statement you referred to the funds being completely under the control of the Federal Administrator. As the present program stands it is my understanding that the States and the localities all support this program financially.

Would you feel it would be better to raise the funds from the Federal side and have them directed through the director himself for all the activities?

Dr. BERKNER. That is an ambiguity in my statement. I meant to refer only to the Federal funds. I do not believe that the State and metropolitan funds should be under the direction of the Administrator. Rather on the contrary, I feel that the metropolitan and State areas have a very important part to play; a part to which they, themselves, should contribute in a financial sense.

Mr. RIEHLMAN. That is what I had in mind, because if you take that responsibility away from them, then you take a certain interest away from them too.

Dr. BERKNER. That is quite correct.

Mr. RIEHLMAN. That's all the questions I have at this time, Mr. Chairman.

Mr. HOLIFIELD. On that point that Mr. Riehlman brought up, would you say that it would be the peculiar obligation of the Federal Government to supervise the overall target area planning which might overlap cities, counties, and States?

Dr. BERKNER. Perhaps the word "supervise" is not the proper word.

Mr. HOLIFIELD. Perhaps take a leading part and approve it before the expenditure of funds in order to see that an effective regional plan, let's call it of defense, would be established and that money would not be wasted and ineffective in uncoordinated efforts in local areas.

Dr. BERKNER. I agree with that. I believe the Federal Government can go far in providing leadership to make certain that adequate metropolitan area plans are set up to provide funds, incentives, and rewards to the area if adequate, and that proper plans were set up and to aid greatly in the field of education, standards, the provision of supplies from central or Federal stockpiles, and so forth.

Mr. HOLIFIELD. Isn't it true that the Federal Government alone has the complete information necessary for that type of planning?

Dr. BERKNER. I believe that is correct, both in the military organization and in the atomic energy centers.

Mr. HOLIFIELD. We have received numerous letters from mayors of large cities and governors and others and their constant request is for more information; they feel that they are inadequately informed, and that information must come from the Federal Government.

Dr. BERKNER. In my statement I have outlined under (*i*) the provision of public information as a Federal responsibility.

Mr. HOLIFIELD. Mr. Fascell?

Mr. FASCELL. Isn't it true, Doctor, that perhaps (*i*) is one of the most important facets of this whole problem because without an understanding of the whole problem we cannot get this integrated cooperation that is necessary to make this thing work?

Dr. BERKNER. That is true. A great deal has been said about public apathy. When one speaks of a social problem like this, you speak with a certain humbleness because no one is quite sure of his ground. But my own feeling is that the public would be prepared to respond quite well to the problem under a program of strong leadership, one in which they had confidence and one which would be reasonably stable over a long period.

I think we now know enough about present and coming weapons systems to produce such a program. I believe therefore that such a program could provide public information over a long range which would lead to great public cooperation.

Mr. FASCELL. Do you agree that as a matter of fact up to the present time we have been woefully neglectful in getting the information to the public?

Dr. BERKNER. This is a difficult question to answer. We were faced at the end of the war with a new situation, we found ourselves in a completely new environment. We know the processes of thinking are simply a physical and chemical process in which we have to re-

associate all ideas in new ways and then add new ideas to these concepts. It takes time for any nation to fully appreciate the changed character of the situation in which it now finds itself. I think the past 5 years has been a period of learning. The ability of our country to respond quickly as early as 1953 to the requirement of continental defense shows we do have this ability to learn quickly when we set our mind to it. Now that the first steps toward a good sound continental defense have been taken, we can turn our minds to a much more thorough construction of nonmilitary defense. Quite aside from civil defense which I interpret to mean rehabilitation of and protection of our people and industries, we should also turn ourselves to the problem of maintaining a producing, viable industry which would be vastly superior to any an enemy can maintain after a retaliatory attack.

Mr. FASCELL. I interpret your testimony on the overall to mean that you do not have too much quarrel with the technical administrative setup with this entire matter but what we need is a reevaluation and a needed emphasis on the entire program.

Dr. BERKNER. I do believe that the responsibilities that now really rest with the Office of Defense Mobilization and the responsibilities that now rest with the Federal Civil Defense Administration should be combined.

I think that these two responsibilities overlap too intimately to be separated administratively. I believe that in combining these responsibilities one might well elevate the resulting structure to the Cabinet level so it can participate in the national defense planning in an intimate way.

I believe that with such a combination and with the further extension of the authority of such an agency by giving the complete control of all Federal funds which are spent for the purposes of nonmilitary defense that one would, and very quickly, achieve the kind of situation which I believe you visualize in your question.

Mr. FASCELL. That's all I have, Mr. Chairman.

Mr. HOLIFIELD. Mr. Lipscomb.

Mr. LIPSCOMB. Doctor, in your statement you have proposed for the Department of Nonmilitary Defense certain objectives. How does your proposal differ from the present objectives of Federal civilian defense and defense mobilization?

Dr. BERKNER. You will note that the proposals fall under two general categories; namely, the responsibility for the maintenance of a balanced industrial capacity after attack and the protective measures and rehabilitation measures required for civilian and facility protection.

The first of these is now partially but not wholly within the authority of the Office of Defense Mobilization. A good many of these responsibilities are scattered in other Government departments with I believe some question of the location of authority with respect to essential parts of the problem.

I would hope that all of the responsibilities for No. 1 on page 100 could be brought into the Federal nonmilitary organization. The responsibility for No. 2 now I believe substantially lies with the Federal Civil Defense organization except that I am not clear that they get all of the funds necessary to supervise their job. I believe it would

be most helpful to them if they supervised all of the Federal funds that were involved in discharging their responsibility.

Mr. LIPSCOMB. Can't we simply say that your proposals, except for one, are already in effect except that they are not aggressively pushed at the present time or they are not coordinated as you propose. Federal Civil Defense and Defense Mobilization have as their objectives all these things that you propose at the present time except one and that is (*g*) going across State lines.

Dr. BERKNER. Yes. But I think the important point is that they are not now organized under a single management.

Mr. LIPSCOMB. So in order to bolster our civilian defense effort, you propose that they all be brought under one department with a cabinet status.

Dr. BERKNER. That is correct, sir.

Mr. LIPSCOMB. But the objectives that we now have—and I don't say that they are being carried out effectively enough—are all within present organizational structures of the two agencies.

Dr. BERKNER. I believe that is generally correct. I believe the objective I have stated of maintaining a workable economy at a reduced level is not now fully stated within the Office of Defense Mobilization. I believe their authority at the moment relates only to the military aspects of that industry.

Mr. LIPSCOMB. On the second page of your statement you talk about 200 principal metropolitan target areas. How was this arrived at?

Dr. BERKNER. 175 to 200. There are about 235 cities of population over 25,000 in the United States at the present time. These are largely assembled in 170 target areas. That is there are certain areas in which cities lie in close juxtaposition, for example, New York, Newark, Jersey City, and so forth. There are some smaller cities which have industries which are so important—not many but some—as to render them important target areas on any enemy list because of the importance of the industry concerned.

Mr. HOLIFIELD. For instance, Oak Ridge.

Dr. BERKNER. A very good example.

Consequently we estimate there might be 200 "metropolitan" targets that an enemy might consider it worthwhile to attack directly. We know when one studies the economy of the United States below the population level of these 200 targets, one finds an extremely large number of targets that must be hit so that it is difficult for an enemy to exercise an intelligent selection below this population level, nor would the damage to our economy with loss of these targets be as great as it would be if any of the top 200 were hit.

Mr. LIPSCOMB. By this statement, what do I gather you advocate in regard to a dispersal project?

Dr. BERKNER. I think that we must think of the maintenance and production of a viable industry and of dispersal as two separated problems. On one hand dispersal while it indeed adds to the protection of our industry is also a measure to protect a metropolitan area in the sense of spreading out the people so they are less exposed to the attack. On the other hand, the maintenance of a viable industry involves the study of our industrial distribution to find out where industries are: a surprising number of industries already lie outside of metropolitan areas.

I think one would find—but I would hesitate to cite examples here—a few industries which tend to be concentrated within our target areas so that not as much as 30 percent of these industries lie outside of our target areas.

We should find out which industries these are and provide incentives to get as much as 30 percent of the industrial capacities of those industries outside the target areas so we will have remaining, even if we lose our target areas, a 30 or 40 percent industry lying outside the major target areas.

If we accomplish this, an enemy is greatly deterred in carrying out an attack since he knows he cannot cripple our basic industrial capacity.

Mr. FASCELL. That raises a very interesting point.

Mr. LIPSCOMB. Isn't that the policy that we have been working on now for a matter of 2 years?

Dr. BERKNER. The policy for the past 4 years has been primarily, where possible, to disperse military industry. This dispersal policy has been not one to move industries outside of target areas but to so locate them that they would be dispersed within a metropolitan area. I think of the problem of dispersal of a metropolitan area as a rather different thing, although in a sense it contributes to the same ends, than the policy looking toward generation of a balanced percentage of the protected industry outside the main target area.

Mr. LIPSCOMB. But you go further with food processing plants, which is a considerable problem. You have to have the processing plants where the food is.

Dr. BERKNER. Well, my feeling is that with a relatively little effort we would be surprised to find that we have already 30 to 40 percent of much of our industry outside our target areas. The knowledge of the facts together with a small expenditure of additional effort to make it completely true would be of tremendous value in providing the enemy the knowledge that an attack on this country is not likely to be very effective, however damaging.

Mr. LIPSCOMB. That's all I have right now, Mr. Chairman.

Mr. HOLIFIELD. Mrs. Griffiths?

Mrs. GRIFFITHS. I would like to know, if you can tell me, if I am 10 miles from ground zero when the bomb falls, will I survive the first blast?

Dr. BERKNER. What kind of a bomb?

Mrs. GRIFFITHS. Any kind you want to name. Even one of these little ones. Will I survive them?

Dr. BERKNER. As is well known the damage from a bomb comes from three major causes and one secondary cause. First of all the blast.

Mrs. GRIFFITHS. Yes; am I going to survive that 10 miles from ground zero, if I am in a house?

Dr. BERKNER. We have to specify the size of the bomb. At 10 miles from ground zero if you had modest shelter which could be provided very easily in your basement you would survive.

Mrs. GRIFFITHS. All right. Now I would like to know.

Mr. HOLIFIELD. Mrs. Griffiths, would you yield at that point? In order to make this more meaningful we should relate this to information which has been made public. I refer specifically to the information made public of the 1954 test in which a certain size bomb was

used, and I believe either Chairman Lewis Strauss or Mr. Libby, and I am inclined to think it was Mr. Libby, testified as to certain effects of the fireball and the blast and also a radioactive pattern of some 7,000 square miles in an elliptical shape.

In order to make Mrs. Griffiths' question more meaningful, let us consider that size explosion, because that is one that has been made public.

Dr. BERKNER. It is an extremely difficult question to answer because it depends on the way in which the bomb is dropped. The height at which the fireball occurs, the size of the blast, the weather conditions at the time of the blast, et cetera, all of these factors can change the effect of the bomb by a great deal on a given locality.

Mrs. GRIFFITHS. I will make my question simpler. I want to know if I do survive at any distance from ground zero, the first blast, in order to remain alive do I have to have additional information or be in a place of great protection, or will somebody rescue me? Today will Civil Defense do it? Will they get me out?

Dr. BERKNER. The answer is that they would get some people out but by no means all that they could if they were fully organized. Certainly the situation is better now than it was a few years ago. But with greater organization I would imagine that they could get 10 times as many people out.

Mrs. GRIFFITHS. Are they now organizing to do that?

Dr. BERKNER. Certainly steps have been taken to move forward, but the greatest weakness in the civil defense structure at the present time is the lack of metropolitan organization.

Mrs. GRIFFITHS. And what is the organization? What are they trying to do to get people out of those areas?

Dr. BERKNER. At the moment, of course, civil defense, as far as I know—I am not in the Civil Defense organization.

Mrs. GRIFFITHS. I see.

Dr. BERKNER. As far as I know it is endeavoring to develop an evacuation procedure. Some people, of course, must always remain in an area and for these we believe in our project East River studies that there should be shelters provided so that you must use a combination of shelter procedure and evacuation to take care of the population.

Evacuation certainly is the greatest protection against the immediate effects of the bomb, the blast, the fire effect, and the neutrons, but if evacuation is carried out and some people move out into open areas without shelter then they may be exposed to the "fallout." Fallout if protection is properly controlled is a relatively simple problem to handle compared to the problems of the blast, fire effect, and the neutrons, because if one is in nominal shelter one can protect himself quite easily against the fallout, with measures that are usually available to everyone provided he has a means of measuring the extent to which he is surrounded by the fallout and resultant radioactivity.

Suitable instruments have been devised and are available quite cheaply and could be in the hands of nearly everyone in a reasonable length of time. The fallout problem can be taken care of provided people have shelter. With a waterhose, with the sealing of the windows, and a few simple measures, they can protect themselves until the fallout dies down and they can move away from the affected area.

Mrs. GRIFFITHS. Would you say that that is one of the main jobs of civil defense—to see to it that people are rescued and that they have information so they do survive?

Dr. BERKNER. This is one of the main jobs of civil defense. This involves not only the organization of local forces but the organization of mobile support, the bringing in of people from safe areas to work around the periphery of the bomb blast insofar as effective work can be carried out.

Mrs. GRIFFITHS. I take it in your judgment it is necessary that the Federal Government supply the leadership in such matters.

Dr. BERKNER. Absolutely essential.

Mrs. GRIFFITHS. I observe your statement that the job of nonmilitary defense is to increase the number of bombs that an enemy must deliver to damage us mortally, but it seems to me the first objective of civil defense must be to rescue those people who can be rescued when the bomb drops, that people not die needlessly. As I listened to the military and to all of the people who have spoken, I get the uneasy feeling that in this war women and children are going to be expendable.

Dr. BERKNER. The problem you state is a very difficult one. If we devote our sole efforts to rescue we may lose the war and the total damage and total destruction may be far greater. Fundamentally I think we must recognize that we have to maintain a basic minimum of effort to be sure that in any war, if it does occur, we do not lose. The greater the likelihood of winning a war, the less likelihood of having a war.

In creating a situation in which it is less likely that an enemy can win a war, we obtain the best protection for the women and children.

Mrs. GRIFFITHS. That is the job for the military to figure it out.

Dr. BERKNER. I say "No." It is the job of both military and nonmilitary defense.

Mr. FASCELL. Mr. Chairman.

Mr. HOLIFIELD. Mr. Fascell?

Mr. FASCELL. The military would have a whale of a time dispersing industry by itself which was not connected directly with the military effort.

Dr. BERKNER. That is true.

Mr. FASCELL. They could move—they could not move the automobile industries out of Detroit for example. Yet that is one of the theories on which your statement is based. That brings up the intriguing problem of how we get it done from a practical standpoint. Would this new integrated department at Cabinet level have any authority to survey the problem and then designate a particular industry which must then move?

Dr. BERKNER. It would occur to me, Mr. Fascell, that the department certainly must survey the situation and find precisely what needs to be done and then I think they have a responsibility of coming to the Congress and stating precisely what the situation is and discussing with the Congress the alternatives that are available and the authority needed with each of these alternatives to do the job.

Mr. FASCELL. Do you envision, then, that Congress would have to assume the responsibilty of designating which civilian industry should be dispersed from a given area?

Dr. BERKNER. I have not advocated dispersing an existing industry from an area. With our present expanding industry I can

visualize that as rapidly as we can make capital investment, if new investment for specific industries were made in safe areas where an adequate segment of industry was not already safe, and if incentives such as tax amortization and other attractions were offered for that particular industry so we could bring its part into balance with the 30 or 40 percent level of protected industry, that we might do this perhaps within 5 years.

Mr. FASCELL. In other words we are not talking about changing the existing thing, but what you are talking about is a survey of the matter to determine exactly where we are and use that as a base for future guidance?

Dr. BERKNER. Yes, sir; exactly.

Mr. FASCELL. Do you envision that in order to do this job properly, since industry is the primary reason for this whole thing, perhaps some type of industrywide committee ought to be organized as part of this survey so that they would have some voice in the situation, rather than making the matter totally and primarily a responsibility of civil defense or nonmilitary defense?

Dr. BERKNER. I think your suggestion is a very good one and I believe it has been used slightly but not fully by the ODM. The idea might even especially extend to the creation of a number of industry committees of various types to survey their own situation.

Mr. FASCELL. Specialized committees.

Dr. BERKNER. And to offer a solution.

Mr. FASCELL. Isn't it true when you talk about industries that they involve the labor force and perhaps the committee ought to be an overall committee composed of industry and labor?

Dr. BERKNER. That is true. This is one of the most difficult aspects of course of decentralizing certain types of industry since they prefer to remain near what might be called a mobile labor force in a metropolitan area.

Mr. FASCELL. But it certainly would involve not only the idea of capital expansion and all the problems that go with that in an isolated area, for example, but it would require the obtaining and maintaining of an adequate labor force to keep that industry going.

Dr. BERKNER. That is true.

When industry moves, generally there is a labor force that follows if this is done in a sensible way.

Mrs. GRIFFITHS. But all of this must be done long before the bomb drops.

Dr. BERKNER. That is right.

Mrs. GRIFFITHS. No committee is going to meet and transfer any plants after that.

Dr. BERKNER. I agree with you fully.

Mr. KILGORE. Doctor, I am very interested in your personal approach to the problem, recognizing the almost insurmountable task of providing either shelter or rapid enough evacuation in population centers with existing communication and highway facilities. I wonder if your general category of information to the public does not become especially significant in connection with the matter of decentralization. I am thinking in terms of the reaction for economic reasons in areas from which industry would move. The reaction for perhaps a different reason in an area that is reasonably well satisfied with its exist-

ence and would not particularly care to be made a target area by having someone move in.

If the overall factor of the reduction in probability of attack because of decentralization is to be accomplished, does not the information necessarily have to be disseminated on a pretty wide scale to achieve an awareness of the necessity for dispersal and an acceptance by those who are gaining in accepting it.

Dr. BERKNER. I don't think you will succeed in moving many industries from a metropolitan area to a safe area away from a metropolitan area, but since the war we have been reconstructing our plants at a rate better than 2½ percent per year.

In 10 years this means we increase by more than a quarter of our total plant capacity. Some of this plant capacity is already going into safe areas. If by careful study of the situation we can find those elements of the industry which are weak because they are concentrated in target areas, we can address ourselves to this relatively small part of our total reconstruction and thereby with little expenditure maintain a balanced industry in the face of any attack that an enemy may launch against us.

Mr. KILGORE. That would reduce the matter of public acceptance a minimum as compared with relocation of present industry.

Dr. BERKNER. I think so. I am afraid this is a very difficult thing.

Mr. RIEHLMAN. Mr. Berkner, are you familiar with the program that ODM has set up?

Dr. BERKNER. I am moderately familiar with it. I have been briefed on it; yes.

Mr. RIEHLMAN. That would deal particularly with many of our strategic areas where we have our great military installations.

Dr. BERKNER. That is right.

Mr. RIEHLMAN. And also our civilian activities are carried on in those areas in respect to production of strategic materials. How well do you think the Federal civil-defense program is coordinated with the ODM program?

Dr. BERKNER. Reasonably well as far as the ODM program goes. During the Korean war there was some decentralization of military industry under the tax-amortization program. I have never been able to ascertain exactly how much was decentralized but some occurred. It was true that in many cases it was necessary during the Korean war to allow industry to rebuild or to expand in areas that were essentially metropolitan target areas. Because of the press of the war it was required that the job be done where an existing labor force, a skilled labor force, was already present. Therefore, during war, either a limited war or a great war, we have almost no opportunity to carry on any planned decentralization of industry.

I do believe that the ODM program could be really more effective if it were planned against a real survey of industry and if the ODM were to work hard in gaining the support of the Congress. I believe the support of the Congress, the understanding of the Congress of this program, is essential to make that effective.

Mr. RIEHLMAN. Then ,to get to this other question I had in mind: What additional authority do you envision the new Director would have under the status of a Cabinet member?

Dr. BERKNER. Well, Mr. Riehlman, I am a great believer that if you want a job done you make one man responsible for it. I feel the

present authority is divided, part in the hands of civil defense, part the support of the Congress, the understanding of the Congress, of in the hands of ODM, part in the hands of other Government departments. I would not suggest that the responsibility for particular operations be removed from the independent Government departments, but that the responsibility to the President and to the Congress and to the people for establishing a sound civil and nonmilitary defense rests in one man who sits high enough to have all the information and authority necessary to do his job.

Mr. RIEHLMAN. Your main point is—and that is what we have all been interested in—that sufficient information flow to the Director so he is constantly informed of the programs that ODM has and the Department of Defense has and all of our military organizations in respect to our defense setup.

Dr. BERKNER. That is true. And also information from him of our civilian Government departments whose responsibility relates to this.

Mr. RIEHLMAN. Of course, at the present time I would expect that our Director has a tremendous amount of information flowing to him from the civilian side. But the point I was trying to make is, Do you feel that without additional authority given to him, other than what our present Director has, that just elevating him to Cabinet status would bring about the interest that you and I have?

Dr. BERKNER. Elevating him to Cabinet status would certainly provide him with a seat in which the provision of additional information would be a great deal easier.

Mr. RIEHLMAN. Information, yes, but I am also talking directly of authority now to carry out his program.

Dr. BERKNER. It would combine the various elements of civil defense that are now split apart into a single authority.

Mr. HOLIFIELD. May I—wouldn't it be necessary for the Congress to give him basic legislation to give him the authority he would need? Just elevating him to the Cabinet position without giving him authority is needed we think in the basic legislation would be an idle gesture.

Dr. BERKNER. I assumed that the words "elevation to a Cabinet position" implied the congressional action necessary to give him that authority.

Mr. RIEHLMAN. Additional authority. That is the point I am trying to arrive at and what additional authority do you feel he needs? If he gets into this position, he certainly is going to have a greater amount of information flowing from all of the sources we have discussed. What additional authority do you recommend that he should have at Cabinet status?

Dr. BERKNER. He should have authority to make the surveys of industries that are necessary to create a balanced industry. This authority may exist now in the ODM, but I believe it does not clearly exist with respect to the civilian aspects of business. Secondly, he should be directed by the Congress to come back to the Congress after such a survey with explicit recommendations in order to create a level of balanced industry. In other words, the Congress, I believe, should make it clear that they want him to come back with suitable recommendations. Thirdly, I believe he should be given all of the authority that the Federal Civil Defense Administrator now has. Fourthly, I think he should be given some authority jointly with the

Department of Defense and with the military departments and the AEC with respect to judgment concerning the classification of military information.

In declassifying information, both aspects, the needs for public information the need for secrecy should be balanced in the final decision.

Mr. RIEHLMAN. But you do feel that the State level and the city, metropolitan-area level and right down to your villages that has to be still on a voluntary basis and he would have no direct authority over there, their activity?

Dr. BERKNER. "He would have no direct authority over the local activities" I think is a correct way to say it; on the other hand he certainly should be in control of certain incentives provided to him by the Congress so if the metropolitan areas organize correctly and properly, as you outlined a moment ago, that these incentives could be provided through his office.

Mr. RIEHLMAN. Well, do you feel that with proper information available to the Secretary, if we call him a Secretary, and that dispensed to our people, would be sufficient to get the voluntary assistance that he needs?

Dr. BERKNER. I really believe this is true: I realize that this is very unsafe ground, but I am inclined to believe that the average American citizen takes his responsibilities pretty seriously. He is not willing to be pushed around, but if he is convinced that the course of action is a wise one and an effective one, he is very likely to get on board quickly. After all our citizens buy bonds. This requires a great effort on their part. They do many other things quite voluntarily and I believe because their own safety is involved and because they felt they were playing a part in increasing the defensive capabilities of the United States quite aside from their individual safety, that they would do this.

This incidentally raises one point. The average person tends to abhor the idea that he should do something for his own safety that might benefit him directly in the face of attack. Somehow or other that does not seem quite right that he should hide under the steps or do something that might be branded as cowardly.

I believe that the importance of the citizen's part in creating the nonmilitary defense with respect to the defensive capability of the United States as a whole should be emphasized. He should feel that aside from defending or protecting himself, his actions are in defense of the whole country. They are playing an important part in it.

Mr. HOLIFIELD. At that point, Dr. Berkner, would it be more unreasonable to require of that citizen in the interest of the Nation compliance with nonmilitary defense regulations, would it be any more unreasonable to request his compliance than it would be to request him to observe Federal laws in regard to transportation of merchandise across State lines, Federal laws in regard to health, inoculations, leaving or coming into our country, such as smallpox, and other kinds of communicable diseases? Would it be any more unreasonable to require him to comply with those than it is with certain requirements which are now required of citizens on a Federal level?

Dr. BERKNER. Certainly not, Mr. Chairman.

But he certainly is more likely to comply with them if he understands them and believes they are going to be effective.

Mr. HOLIFIELD. Wouldn't it be possible if we went at this thing in a serious manner for us to set up regional authorities which would correspond to target areas, the same as we set up regional authorities in the fields of water control, flood areas, or in the setting up of a regional authority, such as the Colorado River function under the Boulder Dam compact. In other words we have resorted at times to regional authorities which have been at least authorized by the Congress for the purpose of solving a problem which went beyond the boundaries of cities and States. If it is important that the Nation survive, and I believe it is, and if it is important that we have the coordination of citizens in adjoining, contiguous political subdivisions, are there not way and means by which this can be done? I'm thinking particularly of setting up regional nonmilitary defense authorities in which you would have Federal leadership but you would certainly have, as we have now, the participation of representatives of local bodies, local political geographical bodies?

Dr. BERKNER. In speaking about the legal aspects of this, of course, I am very far from my field of specialization but it is my understanding that when a regional group is set up that it does require the authority of the Federal Government because of the interstate clause of the Constitution.

If I recall correctly, the interstate water authority between New York, Pennsylvania, and New Jersey, required the approval of the Congress as well as the agreement of the three States involved.

Mr. HOLIFIELD. This was also true, I might say, of the Colorado River compact between 7 States.

Dr. BERKNER. Yes. Living in the metropolitan area of New York we are very much aware that here we have three States certainly involved in the matter of civil defense let alone the many municipal areas that lie in the area.

Because of the fact that cities are usually on important rivers and these rivers are usually State boundaries, most of our metropolitan areas indeed extend across at least the boundaries of two states.

So this kind of legislation and cooperation among the various authorities is necessary. I understand your question, however, to mean this: That it is necessary for the Federal Government to provide authority for these metropolitan combinations for purposes of civil and nonmilitary defense but the resultant pacts would not be directed by Federal authority.

Mr. HOLIFIELD. Let me say that I was more or less thinking out loud as to a solution of this, that of course there is a difference between directing and enabling legislation which would enable groups within an area to come together, and for purposes of mutual protection, mutual benefit, establish a coordinated function, coordinated board, and so forth. At the present time this is no fault of the Civil Defense Agency because the 1950 Federal Civil Defense Act places the major responsibility upon the local political subdivisions. This may have been justified in the day when we had to contend with a 20,000-ton bomb, even a larger bomb. But certainly it looks as though it loses its point when we get into the field of a 10- or 20-megaton bomb in view of the figures which Dr. Libby gave us here on the first day of our hearings, because it is evident when you are dealing with weapons of that class that your weapon itself controls the area of preparation or precaution, let us say. Therefore when we start entering into the field

of diverse political bodies such as States and cities and counties, we have to have some catalytic agency to bring them together.

It is the procedure under our Government that the Federal Government shall act as that catalyzing agency. So I am thinking that the Federal Government can't do it all, but if Federal legislation were passed that would be of an enabling nature saying that if such areas were set up, then the Federal Government would offer certain incentives such as you suggest, maybe equipment, maybe money for planning, entirely possible for certain types of egress and ingress roads and bridges and things like that, which might properly come under the contribution of the Federal Government, maybe on a matching funds basis with local people. Maybe the planning itself should be paid for by the Federal Government because it is primarily the Federal Government's responsibility in my opinion, and once that planning of an area is conceived, there is no doubt in my mind that it would take State legislation and possibly city and county legislation to conform their function with the overall plan, to provide matching funds possibly for the overall plan.

As to what extent the matching funds should be, these are all things that would have to be ironed out. I am trying to think toward a way by which we can solve this problem but a way which has traditional example.

Dr. BERKNER. It seems to me the thinking you have stated is entirely valid. Certainly the Federal Government, to make possible the organization of the metropolitan-regional areas must provide enabling legislation to make possible the organization of the State and municipal units into such metropolitan areas. Certainly if this is to be accomplished as a matter of urgent defense, the Federal Government has a responsibility for the "common defense" to provide the incentives that are needed to encourage the State and municipal governments to initiate the necessary action.

Mr. HOLIFIELD. That does not necessarily mean they pay every cent of it. But it does mean in the interest of the Nation, the overall interest of defense and continuity of life and industrial production, being as you say an obligation for the common defense, it does mean that certainly they should have a larger share of that expense possibly than they have had in the past.

Of course this devolves upon Congress recognizing these principles and furnishing the money to the Federal civil-defense areas.

Dr. BERKNER. I agree with you.

Moreover, the municipalities and States should take just as much responsibility as they are willing to bear without regard to the sources of money. If we ever come to the dreadful day of having to cope with such an actual situation I am sure that the people on the spot if trained and organized would be able to do the best job.

Mr. HOLIFIELD. Do you not agree with me that it would be impossible for the Federal Government to go into one of these regional areas on its own and do the job?

Dr. BERKNER. It is quite impossible.

Mr. HOLIFIELD. They must depend on complete cooperation of your local police and fire officials and the people of the area, the people themselves individually have a responsibility not only to themselves and their families but to their neighbors to become part of the overall

plan and participate in it. One of our weaknesses as I understand it in my hometown, and I think other members will probably testify the same, has been that we have depended completely upon voluntary participation in the civil-defense areas, where we certainly do not depend on voluntary cooperation in the field of sanitation for instance and in the field of traffic movement. We do not depend upon a man's voluntary willingness to set his garbage pail out for collection for the health of the community.

That man has to do that or suffer local penalties. The same is true in the movement of traffic. We do not depend upon voluntary cooperation in that field. We tell them that you have to drive on the right-hand side of the street at a certain speed. If he does not comply in the interest of his own safety and that of society, he suffers a penalty. When we get into the field where the continuity of the Nation is at stake, why are we so chary about enforcing, not necessarily a Federal penalty, I don't suggest that, but there are adequate police and fire and sanitation laws within our different States, and with enabling legislation on the Federal level to authorize regional defense areas, certainly the implement to that would be the passage of State legislation—and this is no new suggestion, that has been done in other fields many, many times—to implement and fit the pieces of the local subdivisions into this overall hazard which is a primary Federal responsibility, in my opinion.

Do you agree in general with that type of thinking? If not, I would like your thinking on it.

Dr. BERKNER. I agree fully with that type of thinking. I would add one point. Beyond the immediate metropolitan area there must always be organized a mobile support in depth. But by this we mean the support from the police departments, the fire departments of the surrounding "little towns." Perhaps they can only contribute 1 fire engine or 2 police, but the small towns who contribute trained personnel and necessary equipment are essential to the protection and rehabilitation process. Occasionally this must be done across State lines and it may not be involved in the direct metropolitan legislation. Here the Federal Government can be most helpful in aiding the States in creating the necessary cooperative pattern.

Mr. HOLIFIELD. I notice in the introduction to the Project East River 1955 review you state:

> **Despite the efforts made, it is necessary to report that the Nation's preparations and progress in nonmilitary defense are still far from what they would be.**

Do you stand on that statement?

Dr. BERKNER. Yes.

Mr. HOLIFIELD. You also said, "Thus, while progress has been made in both areas, relatively speaking," speaking of the advance in weapons and delivery systems, "the gap between the threat and the nonmilitary defenses has widened." In other words, in your opinion has the pendulum swung to the advantage of the offensive at this time?

Dr. BERKNER. It didn't swing slowly. It took one great jump.

Mr. HOLIFIELD. Let's say that the pendulum is there. "Man generally seems to be more adept in making technical and scientific advances than in making the social and other adjustments necessary to cope with such material progress." And your third point was "In view of this handicap, there has been lipservice but not the posi-

tive leadership needed in the field of nonmilitary defense." Do you stand on that point?

Dr. BERKNER. Yes.

Mr. HOLIFIELD. To get back to Mrs. Griffiths' question a moment ago, I have here an analysis of Dr. Libby's testimony before this commitee on January 31 and this has been checked and approved by the Atomic Energy Commission staff. This shows that a 10-megaton weapon exploded at a certain height would create within a radius of 12 miles severe damage to homes, that by simple computation times π I believe would give us roughly 38 square miles of severe damage. A 5 megaton would be in the nature of 9.5 miles radius or approximately 30 square miles of damage. That is a 5 megaton.

Dr. BERKNER. Ten miles is the radius. Ten miles squarred is a hundred and multipled by π and that would be 300 odd square miles.

Mr. HOLIFIELD. I forget my algebra. That is right. That increases it by a factor of 10. I figured this out very quickly and I certainly failed. That would make it 380 square miles on a 12-mile radius or 300 square miles on a 9.5 square mile. He testified that severe structural damage would occur to steel-framed buildings in a 9.6 mile radius or 300 square miles for a 10-megaton weapon and 7.6 radius on a 5 megaton and 1.2 on a 20 kiloton such as Hiroshima. These are the factors of impact that we are dealing with, these are the factors of hazard. In view of that fact, what would you say would be the relative importance of civil defense in our overall defense program? Is it insignificant, is it important for the Nation's survival and to the preservation of the lives of millions of our people that they be given the very best plan that is possible or is it a matter of no particular moment?

Dr. BERKNER. Of course, it is a matter of tremendous moment. If one were to assume that every bomb were to hit the center of every city, many of our targets would be completely destroyed because of the number that you have given, but a surprising number of people would survive because of their particular situation at the time of the drop in spite of the very great destruction and almost complete devastation of a city. Were we fully prepared to go in immediately after the drop and take the necessary measures for rescue and rehabilitation of the area, I think one would be quite astonished at the effectiveness of such an operation.

Mr. HOLIFIELD. As you say, the probability of each one of them hitting at the theoretical perfect point of ground zero is another factor to be considered.

You can't therefore say to the people in a city like Washington here, that the bomb is going to be exploded just over the Washington Monument if that is the most effective point. It might be exploded over Alexandria or Silver Spring; therefore the obligation to take cover and take such precautions as can be taken would be on the whole population because you know not where point zero will be.

Dr. BERKNER. It is impressive to know that some people close to point zero not only survived but survived relatively unscathed during the Hiroshima drop. Individual people were protected by concrete and so forth. One can't predict if you are right in the center of the drop that you will survive a heavy blast. Under certain circum-

stances there will be a large number of people who will survive and survive under conditions in which they will continue to live. They should be rescued.

Mr. HOLIFIELD. Depending upon the height at which the bomb was exploded.

Dr. BERKNER. Right.

Mr. HOLIFIELD. And the shelter and the quality of the shelter which they have.

Dr. BERKNER. It is interesting to note that in a large city hit by a megaton bomb, that immediately after the drop it may be quite impossible to get into the center or close to the center of the city. Almost certainly a fire storm will develop on the outskirts of this bomb drop. With well-organized support this probably can be controlled, large amounts of property saved and literally tens or hundreds of thousands of people saved that would not otherwise be saved. One cannot count the exact situation at Hiroshima which was a small-scale drop. Here it is clear if they had been organized they would have perhaps saved half the population that were otherwise killed.

Mr. HOLIFIELD. Do you think that a real civil defense is worthwhile or would we be wasting resources to go ahead with an increased expenditure in that field? Maybe we should put that amount of money on the Strategic Air Command. What do you think at this time is the relative importance of having the best type of civilian defense that we can evolve?

Dr. BERKNER. I think of first importance is the need to maintain a certain balanced minimum industry because of great deterent effect when this is associated with our strategic airpower. We want to create a situation in which an attack is most unlikely and this step seems to be essential for that purpose. Beyond that it is probably true that a good civil defense would save of the order of, depending upon the size of the city, of a hundred thousand to a couple of million people in each city. It seems to be self-evident that here the measures toward the protection and rehabilitation of the population are well worthwhile. Not only from the humanitarian point of view but from the point of view of the importance of these people to our national economy after the destructive attack has taken place.

Mr. HOLIFIELD. Then your opinion is that this is an important field to explore and to if possible find the best solution possible.

Dr. BERKNER. In the atomic age I think it is vital.

Mr. HOLIFIELD. To what do you attribute the lack of progress in implementing some of the recommendations contained in the East River report, 1952?

Dr. BERKNER. Many of these recommendations have been implemented, and I had hoped at the beginning of my statement to indicate that I think we should not decry the progress that already has been made, and some very good progress has been made.

In part the delays are due to just the learning time of people, that is, it takes time to become accustomed to ideas and to become willing to do something about it. But I do believe that better centralized authority, and a strong rapport between whatever agency emerges from these hearings and the Congress itself, is necessary to get this job done at a reasonable rate.

Mr. HOLIFIELD. We are aware of the progress that has been made, such as your early warning line, the defense in depth measures, and

the subcommittee has been briefed thoroughly on the extent of those preparations.

Dr. BERKNER. Stockpiling of medicines.

Mr. HOLIFIELD. Stockpiling of medicines, and so forth.

Dr. BERKNER. Portable hospitals.

Mr. HOLIFIELD. We are also aware of the fact that less than $100 million have been assigned where something like $35 billion have been assigned to the military, and this possibly is the fault of the Congress in not realizing this. Do you have any suggestion to make with respect to possible research and development needs of the civil defense program?

Dr. BERKNER. Yes. I think that research and development with respect to simple and cheap instrumentation which can be put into the hands of everyone to check the fallout situation should be worked out.

Mr. HOLIFIELD. There is a project in the Atomic Energy Commission.

Dr. BERKNER. Yes. The Atomic Energy Commission is working on this, and I hope this yields results shortly, because the protection from fallout is something required by almost every citizen, whether he lives in the city or in the country.

Mr. HOLIFIELD. In other words, a man a hundred miles downwind from a 10-megaton blast might well be in the position of the Japanese on the *Lucky Dragon*.

Dr. BERKNER. Right. On the other hand, if he has no means of detection, he is going to be very seriously damaged or killed; but if he has protection, some means of detecting his situation, his protection is a simple matter.

Mr. HOLIFIELD. Then there is, by the simple procedure of changing his clothing and taking a shower, the fact that he can take radioactive ash off of his person if he moves promptly enough.

Dr. BERKNER. Right. Keep himself and his family inside the house until the radioactivity goes down, get the garden hose, wash off the steps so he can get outside.

Mr. HOLIFIELD. This, as I say, would require a pretty wide distribution of detection instruments. It would also have to require professional monitoring teams for the detection of radioactivity in certain areas, setting up of warning signs and boundaries for areas which remain too hot radioactively for human survival.

It certainly would require emergency types of communication, would it not?

Dr. BERKNER. Although presumably our broadcasting systems might be used for this purpose.

Mr. HOLIFIELD. Yes. If they were not incapacitated.

Do you believe we are making full use of our technical capacity in developing monitoring, warning, and decontamination devices?

Dr. BERKNER. As far as I know, we are doing pretty well on this. The Atomic Energy Commission has taken the leadership, of necessity. The Armed Forces also have a responsibility in this matter, and they are also taking a good deal of leadership.

The extent to which this information has been passed on to the public, I am not sure of. I get the impression that data on instruments and circulation of information could be more widespread.

Mr. HOLIFIELD. There have been, of course, statements made by Mr. Peterson, there have been statements made by Mr. Strauss, Dr. Libby,

and many others who have intimate knowledge of these problems. Their statements have been made on television and on radio. But notwithstanding these statements, do you believe that the ordinary citizen throughout the land, who might reside, and must of necessity, the majority of them reside in these target areas—do you believe he has a concept of the hazard and a concept of what he should do to better the chances of survival for himself and his family at this time?

Dr. BERKNER. I do not believe he has, Mr. Holifield, and I think we are going to have to get down to the mechanism of the school meeting or the town meeting, in which groups of people get together with experienced leaders who can tell them intimately and demonstrate how to behave, what instruments to use or what instruments are being used on their behalf, before they can understand.

Mr. HOLIFIELD. In other words, a complete educational program has got to be evolved and put into effect before the people know the hazards, and also before they know the measures to take to give themselves the best chance of survival.

Dr. BERKNER. That is quite correct. It must be done on the intimate town or village level.

Mr. RIEHLMAN. Mr. Chairman, may I ask a question at that point.

Mr. HOLIFIELD. Yes.

Mr. RIEHLMAN. Do you have any knowledge of how far we have expanded in that type of a program under our present setup?

Dr. BERKNER. I believe, Mr. Riehlman, this varies a great deal from one city to another and from one town to another.

I am under the impression, for example, that the city of Milwaukee has progressed quite far. On the other hand, I believe nothing at all has been done in many other cities.

Mr. RIEHLMAN. Another reason I ask that question, Mr. Chairman, I just cannot recall the city, but I know I have been somewhere where that program has been going on, and they have gone out to the communities and to the schools. I wish that I could put my finger on the community.

Dr. BERKNER. The State of Washington has been very active in it.

Mr. HOLIFIELD. I think Milwaukee.

Mr. RIEHLMAN. That might be, but I know there has been some activity in that field, but I did not know how far that had been expanded.

I suppose we will get that from the civil defense people when they get here.

But what the response has been is another thing we are deeply interested in. I want to get back to just one other thought the chairman raised here in respect to responsibilities of Congress.

I think we have been lacking in bringing to the attention of the people the importance of the program and really taking serious action to promote it and to report to Federal civil defense ourselves. I suppose some of it has been on the basis that we were not too sure how strong a program they had set up and how effective it was, and that is the only reason why I am so serious about learning as to how we can, through a new type of setup—whether it be a Cabinet rank or other—penetrate down through to the mass of American people to bring this to their attention, and how effective it is going to be, unless we give additional authority to this new Secretary from the Federal level to do some things which will have to be done.

Mr. HOLIFIELD. That was a comment.

Mr. RIEHLMAN. I wanted to make that comment and find out what he thought about it.

Mr. HOLIFIELD. I wanted to say, I certainly agree with Mr. Riehlman on this.

I want to ask you this question. We are going to be pressed for time, but did the 1955 Project East River Review Committee consider the possibility of releasing to the public the three classified volumes?

Dr. BERKNER. We did not consider that. This is really beyond our competence, and it would rest, of course, with the executive branch of the Government.

Mr. HOLIFIELD. Would you care to give us your personal opinion as to whether they should be released or not?

Dr. BERKNER. There is some information in those volumes which would be very useful to the public in organizing civil defense, which has not yet been publicly discussed.

Mr. HOLIFIELD. Would you in general say that every effort should be made to declassify as much information as possible in the field of weapon effects—I believe that would be the field where it would be most advantageous to the local community—in the field of weapon effects?

Dr. BERKNER. I would certainly recommend this, of course relying—may I make a statement on that point?

Mr. HOLIFIELD. Yes.

Dr. BERKNER. It seems to me that the whole problem of declassification involves a balance of interests. We have to weigh, on the one hand, the military strength that we acquire by maintaining information secret, and the losses that we acquire by maintaining this information secret, and these must be balanced.

Very often, it seems to me, we balance this on the side of too much secrecy. That information to the public would actually give our country greater strength than we have at the present time.

Mr. HOLIFIELD. It is not necessary for the public to know how a bomb is made. What they have to know about is the extent of the hazard of the explosion of that bomb at different heights over a target area.

Dr. BERKNER. Right.

I believe that actually a great deal of information is declassified, but it needs to be organized in a very consistent way, because even I, sometimes, am not quite sure where the boundary is, and therefore tend to stay over on the side of safety by not talking about a subject.

Mr. HOLIFIELD. And scattered statements made on this point and not brought together as we are trying to bring together these statements, lose their overall meaning to the public, because they get a little bit here and a little bit there, and they forget something they have had before.

But if we can get this, which is one of the things we are going to try to do—that is, get enough of this information together in one volume so that it is available to the civil-defense people and other people who are concerned with this problem—why, we feel that it will be of service to the Nation.

Dr. BERKNER. Right.

Mr. HOLIFIELD. Do you care to comment upon the subject of the declaration of martial law?

Dr. BERKNER. This is really beyond my field of competence. I imagine that some of my legal colleagues would be very happy to comment on that.

Mr. HOLIFIELD. We will have some representatives of the bar before us on this problem, on both sides of the issue, because we have no desire to just put one side of any issue on this record.

Dr. BERKNER. Right; and the extent and the effect of it.

Mr. HOLIFIELD. Are there any further questions of Dr. Berkner at this time?

Mr. LIPSCOMB. Mr. Chairman, I would like to make a suggestion to the Chair. Could we ask Dr. Berkner to submit whatever background information he has from which he developed this first point in regard to dispersal, in his statement, regarding the 175 to 200 principal targets and the dispersal of our industry?

Dr. BERKNER. I would be very glad to do that.

I might say that this information is contained quite adequately in one of the classified sections of the Project East River. The information itself is not classified, but it was developed because the related information was classified, and doubtless would be available to the committee members in that document.

Mr. BALWAN. We have the classified document. We have not provided it to the subcommittee.

Dr. BERKNER. That can be found quite adequately in section 3 of Project East River.

Mr. BALWAN. Mr. Chairman, I think the reason Mr. Lipscomb is asking the question, it appears to not coincide with the information which we received in our briefings at Continental Air Defense. We had no reporter at that hearing, and, therefore, our memory is a little bit vague on it, but it does not seem——

Dr. BERKNER. It does not coincide with the total number of target areas, because there are many military target areas which are not included in this number.

Mr. BALWAN. The other way around. I think they listed fewer rather than as many as this.

Mr. HOLIFIELD. Then let us say that their listings were concerned primarily with military targets, and your testimony is concerned primarily with metropolitan or urban areas.

Dr. BERKNER. Urban.

Mr. HOLIFIELD. I think it depends on the group that are evaluating targets, as to what is—certainly, the priority of the target depends on whether it is the military or whether it is the people who are concerned with preservation of civilian life in urban centers, so we might have a variance there, but I think it is something which could be reconciled if we knew the formula by which you arrived at the number of targets.

Dr. BERKNER. Well, this information is completely contained in chapter 3 of Project East River.

Mr. LIPSCOMB. Mr. Chairman, I believe in our study, the study of target areas is going to be a very important factor in our decision.

Mr. HOLIFIELD. Yes, it is.

Mr. LIPSCOMB. And the quicker we get together all opinions on target areas, the better it will be for the committee.

Mr. HOLIFIELD. I certainly agree with you.

On page 1 of your introduction of the review of the East River project, you say:

> Because of understandable difficulties, the Office of Defense Mobilization, assisted by other Federal agencies, particularly the Departments of Commerce and of Defense, has been able to make only limited progress in the decentralization of new industrial construction under the tax amortization program. If there has been a net reduction in urban vulnerability, it has been very small.

That is the considered opinion of your group, is it not?

Dr. BERKNER. That is correct. That has been examined quite carefully.

Mr. HOLIFIELD. And with reference to your testimony this morning in which you say that there has been dispersal within urban areas to a much greater extent than dispersal outside——

Dr. BERKNER. Away from it.

Mr. HOLIFIELD. Away from urban areas, and, therefore, under the concept of this new weapon, with its wider scope, your recommendation to the committee is that consideration on the matter of dispersal should be given to dispersal outside of an urban area rather than within.

Dr. BERKNER. Well, I think that dispersal and the maintenance of a balanced industry should be considered as two different matters. The maintenance of a balanced industry requires that certain additions be made to our now protected industry that lies outside of our metropolitan area; whereas dispersal within a metropolitan area relates to the protection of the population and the industrial potential of that area, and the rehabilitation of that area; but it may have little to do, if we have a balanced industry outside, with what we have done with respect to that balanced industrial area.

Mr. HOLIFIELD. Of course, it is evident we are not going to have a complete dispersal to the point of putting us in a position, in the best position, to withstand such an attack, because of the tremendous investments in certain areas and the productive capacity in certain areas. So this is a matter of a long-range program that you suggest, rather than an immediate, short-range program, I suppose.

Dr. BERKNER. I cannot imagine our getting along without cities. Man is a social animal. He likes to live where other men are, and our cities certainly will always exist.

My only really urgent plea is that we get some proportion of our industry outside of the metropolitan areas so that they don't—so an enemy cannot think he can destroy us by simply hitting a few targets.

Mr. HOLIFIELD. I am going to ask you a question which may not be a good question, but, in view of all of the realities of the present situation, the early warning time which we now have, the facilities outside of urban areas to take care of large populations if evacuated, and so forth, what would you say would be the factor, the best factor of defense that the average civilian could depend upon at this time? Would it be on evacuation, or would it be on taking protective cover?

Dr. BERKNER. I think this depends on the individual. Certainly, if one is a grandmother or an invalid, or someone who is not essential to a metropolitan area, and intelligence made available to the public indicated the possibility of developing conflict, it would be wise for those people to move out long in advance of the immediate warning.

Mr. HOLIFIELD. Now, wait a minute. Let us analyze that a minute. Are you advocating evacuation before warning?

Dr. BERKNER. I am advocating really three kinds of warning: One, a warning that I would call a strategic warning; the situation which is created when things really begin to get tight; when the President considers there is a possibility that an approach to the brink of war may occur in the very near future. And here, certainly, wisdom would dictate that people who are not essential to a metropolitan community might, on their own, and leisurely, move out in a protected area.

Mr. HOLIFIELD. But, of course, if that extended to any great numbers of people going out of a city, would it not disrupt the ordinary transportation and the production in a city?

Dr. BERKNER. Not if it is done in a reasonably leisurely way. This actually happened in London at the beginning of the bombing during the last war.

Mr. HOLIFIELD. You are thinking of evacuation of women and children?

Dr. BERKNER. Not all women and children, but those not essential to the functioning of the community.

Secondly, in the case of immediate warning, a certain proportion of the population can be evacuated, again depending upon their essentiality to the community. But I rather think that it may not be wise to evacuate the whole of the community; certainly, police power has to be retained in the center of the community. One is never sure where the center of the bomb is going to fall, and the purpose of evacuation is to distribute the population over as wide an area as possible, with the lowest density possible.

I do not believe that the density of the center of the city should be reduced to levels greater than those on the outside perimeters, because, if everyone moves to the edges and the bombs fall on the edges, you are still in trouble. But, if you distributed your population rather uniformly over a much larger area, then the total population protected is the maximum.

Mr. HOLIFIELD. That is true.

Dr. BERKNER. These curves and data can be found in the classified sections of the East River report.

Mr. HOLIFIELD. But speaking without referring to those reports, when we would reach that stage, would that not place a burden for care, food, medical care, and that type of thing, upon outlying areas, which at this time they are not equipped to handle?

Dr. BERKNER. The limitations which you have just stated are certainly the limitation on the extent of evacuation that should be carried out.

Mr. HOLIFIELD. In other words, prior to any extensive evacuation, we must build up facilities, either in private homes, or plan private homes taking care of these additional people, or shelters, and certainly concentrations of food to feed them and medical supplies, some of which is already being done, of course.

In other words, there is a great area of preparation which must be completed before we can evacuate large populations from our centers.

Dr. BERKNER. Yes. Probably the limiting factor on evacuation is the fact that no one who is evacuated should be permitted to stay outside. He must have a place to which he can go, where he has cover over his head, or he may be exposed to fallout, and you may unnecessarily lose large numbers of people due to fallout.

Mr. HOLIFIELD. In those cases, would not the average individual, if he had a shelter in his own backyard, with a reasonable amount of water and food supplies and possibly medical supplies, would he not stand a better chance of survival than joining hundreds of thousands on roads, packed roads, leading out of the city?

Take the case of an emergency warning, which I am speaking of now.

Dr. BERKNER. He might as an individual, and I would emphasize that it is my own view, and it is the view of the project East River report, that a combination of shelter facilities and of evacuation should be used. One should not bet completely on either one.

Mr. HOLIFIELD. Would that not also depend on the cities involved? There are cities which have a limited number of roads for egress.

Dr. BERKNER. That is right.

Mr. HOLIFIELD. And there are other cities which have many roads for egress. There are cities which are located in, you might say, bowels, or areas surrounded by mountains, where the physical, geographical handicap keeps them from evacuation, and certainly those people should not be—they should have a particular plan.

In other words, each target area should have the best plan which is possible for the particular target area.

Dr. BERKNER. I think that is a good statement.

Mr. HOLIFIELD. And, therefore, you cannot apply the same plan to all target areas.

Dr. BERKNER. That is correct.

Mr. HOLIFIELD. Because of these varying factors of egress and ingress and geographical or topographical positions.

Dr. BERKNER. One should remember that rather simple shelter conditions, out at the fringe of a bomb area, will provide good safety for an individual.

Mr. HOLIFIELD. Much safer than a hundred miles down the open road.

Dr. BERKNER. If he is, especially, in line with the fallout.

Mr. HOLIFIELD. With the fallout.

And is it not a fact that it is very hard to predict at all times, and in the prevailing wind, in time to get that information to the people?

Dr. BERKNER. That, again, varies with the city.

Mr. HOLIFIELD. I understand there has been some increase in thinking along that line in the Federal Civil Defense Administration, according to the papers the other day, increasing the weather warning complement of personnel in these different target areas, which I think is a good thing, by the way.

Mr. LIPSCOMB. Mr. Chairman.

Dr. Berkner, in your thought about evacuation, what thought have you given as to how we should tell the people who should evacuate and who should stay?

Dr. BERKNER. Well, the basic warning should always be given by the Federal Government.

Mr. LIPSCOMB. I am talking about individuals. Who should tell the individual who should go outside of the target area and who should stay in the target area?

Dr. BERKNER. Certainly the local authorities must carry this responsibility. Whether they do this by telling the people they do this or that, or advising them or perhaps even listing them with respect

to their occupational situation, with respect to their individual positions, this certainly is a matter of local interest. This should be done at the local level.

Mr. LIPSCOMB. Do they necessarily have to have police power to do that? Or do you foresee that if a warning came which was of general knowledge, that perhaps there might be panic and people would start a mass evacuation?

Dr. BERKNER. They will eventually have to evacuate the central area, of course. But my feeling is, when an actual bomb blast occurred, that the mass evacuation by panic would only occur from the outside of the periphery. Unless the city had very good and well organized protection, a fire storm would grow up around the edges, and the individual would be faced with a complete dilemma as to where to run.

Mr. LIPSCOMB. I understand that.

You have advocated if we did get advance warning, that we ought to take the women and children or grandmothers and ask them to leave.

Dr. BERKNER. That is right.

Mr. LIPSCOMB. Well, who is going to tell the men of the families that they should stay, too, if they do not feel honorable enough to stay?

Dr. BERKNER. In each community, it seems to me that a decision should be made, depending upon the situation in which the individual groups find themselves, and recommendations made concerning evacuation on strategic warning, evacuation on immediate warning, and staying on the job.

Mr. LIPSCOMB. Do you mean that the whole system should operate on the honor of the people?

Dr. BERKNER. You gentlemen are much more familiar with the matter of legislation and the performance under legislation than I, but I rather feel that, even given the choice, you would find that various people would choose different courses of action and, without any real pressure on the population, that you could easily divide among those who should evacuate early, and those who should evacuate later, and those who should remain.

Mr. HOLIFIELD. This comes down, of course, to the very guts of the problem, and that is, can a civil defense or nonmilitary defense system, an effective one, be built up on the basis of voluntary participation? And if we come to the conclusion that voluntary organizations do not, in times of emergency, function properly, the next question is: What kind of pressure can be brought to bear upon them in the democratic way, democratic process, to insure that each person, insure as nearly as possible, that each person does that which is best for himself and for his neighbor? And there, of course, you come to either Federal force or local police force, and, of course, there are several kinds of force in each instance which can be used: An immediate declaration of martial law, without a plan, might place upon the Defense Department, who are ordinarily given the administration of martial law, a burden which they are not expecting and which would detract from their regular duties.

On the other hand, if you have adequate State police laws to take care of a situation like that, it might be that Federal direction on the basis of local police law administration and execution, might be sufficient, and still maintain your civilian democratic processes.

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These were the possibilities which we were exploring.

Dr. BERKNER. I certainly am not expert to comment on the legal aspects of this. I can only mention my personal preference, which would be one of hope and expectation that the local authorities could find enough strength to do this job.

Mr. HOLIFIELD. Was there a question?

Mr. RIEHLMAN. I just had one question.

In view of the fact that we had the East River project, and also we have had a recent review of it, would you care to comment on General Sarnoff's suggestion that something on the plan of the Hoover organization be set up to study this whole civil-defense program again?

Dr. BERKNER. It is my feeling, Mr. Riehlman, that we are—we now how a sufficient grasp of the subject so that we can move ahead without any further study.

Mr. RIEHLMAN. To use the evaluation of what your committee had when it was organizationally set up, and then use the information that now is available from your recent review, we should be in a position to have sufficient information to set up the type of civil defense which is necessary for our Nation.

Dr. BERKNER. That is right. And I would not ignore the immense information which has already been acquired by the Civil Defense and the ODM organization.

Mr. HOLIFIELD. In other words, you believe that now is the time for Congress to study this and go into action?

Dr. BERKNER. I do.

Mr. HOLIFIELD. Rather than to appoint other study commissions.

Dr. BERKNER. I believe so. That is my belief.

Mr. HOLIFIELD. Dr. Berkner, you have given us some very fine information this morning, and we wish to express on behalf of the committee our appreciation for your appearance here this morning and the testimony which you have offered.

I know it has been of some inconvenience to you, because you are a busy man. Nevertheless, I hope that the testimony which you have offered and the time you have expended will not be of no avail. I hope it will be of help to us in arriving at the conclusions we are looking for.

Dr. BERKNER. Thank you, Mr. Chairman.

Mr. HOLIFIELD. Thank you.

The committee is adjourned.

(Whereupon, at 12:10 p. m., the subcommittee adjourned.)

CIVIL DEFENSE FOR NATIONAL SURVIVAL

WEDNESDAY, FEBRUARY 8, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS OF THE
COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met, pursuant to call, at 10:05 a. m., in room 1501 New House Office Building, Hon. Chet Holifield (chairman of the subcommittee) presiding.

Members present: Representatives Holifield (presiding), Kilgore, Fascell, Griffiths, Riehlman, and Lipscomb.

Also present: Michael P. Balwan, staff director; Herbert Roback, director of investigations; James Eckhart, assistant counsel; Earl Morgan, staff member; Robert McElroy, staff member; and Carey Brewer, Legislative Reference Service, Library of Congress.

Mr. HOLIFIELD. The subcommittee will be in order.

We have as witnesses this morning Dr. Merle A. Tuve and Mr. Willard Bascom.

Which one of you gentlemen prefers to start first? Is there any particular order that you would like?

Dr. TUVE. I would like Mr. Bascom, our technical director, to start.

Mr. HOLIFIELD. Mr. Bascom, you have received from the committee the letters and the copies of the bills, as I understand.

STATEMENT OF WILLARD BASCOM, TECHNICAL DIRECTOR, ADVISORY COMMITTEE ON CIVIL DEFENSE, NATIONAL ACADEMY OF SCIENCES

Mr. BASCOM. Yes, sir; that is correct.

Mr. BALWAN. Mr. Bascom, would you tell the subcommittee what your experience has been in the past, your training?

Mr. BASCOM. Yes, sir; I will be glad to. It is *Mr.* Willard Bascom, by the way.

I have the title, at the moment, of Technical Director of the Advisory Committee on Civil Defense of the National Academy of Sciences—National Research Council. I have held this position for a little over a year and a half, and I think it makes me one of the few professionals in the civil-defense business who doesn't work for any real civil-defense organization.

This morning I speak as an individual, but naturally I cannot entirely shake off the fact that I am associated with that group.

Mr. BALWAN. What about your training and background?

Mr. BASCOM. Since 1945, I have been associated with the University of California, both at Berkeley and at Scripps Institution of Oceanography.

I am an engineer. For a good deal of this time, I have been involved in military engineering problems, amphibious and undersea warfare, and I have been involved in two of the major weapons tests as an engineer, the Ivy Mike series and Castle series of 2 years ago. Since then I have been involved to some extent in atomic tests in Nevada, and also on other shot groups which cannot be mentioned at the moment.

Mr. BALWIN. Are you a physicist?

Mr. BASCOM. No, sir. I guess I could be described as an engineer. I was originally trained to be a mining engineer, although I have not worked at that since the war.

Mr. BALWAN. Could you explain in a little bit more detail the organization you work for, and how it fits into this picture, how that happens to be related to FCDA?

Mr. BASCOM. Yes, sir. I have a statement here which is an account of the general relation of the Academy-Council to Government as a whole, which was prepared by the academy and has been referred to from time to time.

The National Academy National Research Council is a private, nonprofit organization whose object is to advise the Government on various problems of research and development.

In connection with this, Mr. Val Peterson, around 2 years ago, asked that the academy set up an advisory committee to advise him on so-called technical problems of civil defense. With that in mind, I was asked to come here from California. A chairman was selected, Dr. Merle Tuve, from whom you will hear later on, and with the collaboration of Dr. Tuve and Dr. Bronk, the president of the academy, a group of some 12 scientists and well-informed people were assembled who make up our committee now. I have a list of the committee membership.

Mr. BALWAN. Could you just read through that briefly?

Mr. BASCOM. I would be glad to.

The Chairman is Dr. Tuve, who is a physicist; and in alphabetical order: Mr. Gerhard D. Bleicken is an officer of the John Hancock Life Insurance Co., and well versed in civil-defense matters. Professor Herbert Bosch is known for his work in sanitary engineering. David Cavers is associate dean of the Harvard Law School. Dr. Eugene Cronkite is at the Brookhaven National Laboratory. Professor David Dennison, who is chairman of the physics department at the University of Michigan. Dr. Richard Emberson, has been much involved in the East River project. Mr. E. H. Holmes, who is a highway engineer with the Bureau of Public Roads. Mr. Rensis Likert, is a sociologist, and is director of the Institute for Social Research. Dr. R. B. Roberts, a biophysicist from the Carnegie Institution. Dr. Herbert Scoville, who is one of the world's authorities on weapons effects. And Dr. Lauriston Taylor, physicist, who knows a great deal about radiation physics.

(The list of advisory committee members is as follows:)

NATIONAL ACADEMY OF SCIENCES, NATIONAL RESEARCH COUNCIL
WASHINGTON 25, D. C.

ADVISORY COMMITTEE ON CIVIL DEFENSE

MEMBERSHIP

Chairman, Dr. Merle A. Tuve, physics, department of terrestrial magnetism, Carnegie Institution of Washington, 5241 Broad Branch Road, Washington, D. C.
Mr. Gerhard D. Bleicken, law, John Hancock Mutual Life Insurance Co., 200 Berkeley Street, Boston, Mass.
Prof. Herbert M. Bosch, sanitary engineering, school of public health, University of Minnesota, Minneapolis, Minn.
Dean David F. Cavers, law, law school of Harvard University, Cambridge, Mass.
Dr. Eugene P. Cronkite, M. D., hematology, Brookhaven National Laboratory, Upton, Long Island, N. Y.
Prof. D. M. Dennison, physics, University of Michigan, Ann Arbor, Mich.
Dr. Richard M. Emberson, physics, Associated Universities, Inc., 350 Fifth Avenue, New York, N. Y.
Mr. E. H. Holmes, highway engineering, Chief Highway Transport Research Branch, Bureau of Public Roads, Washington, D. C.
Dr. Rensis Likert, sociology, director Institute for Social Research, University of Michigan, Ann Arbor, Mich.
Dr. R. B. Roberts, biophysics, department of terrestrial magnetism, Carnegie Institution of Washington, 5241 Broad Branch Road, Washington, D. C.
Dr. Herbert Scoville, Jr., physics, weapons effects, 2430 E Street NW., Washington, D. C.
Dr. Lauriston S. Taylor, physics, radiation, Chief Atomic and Radiation Physics Division, National Bureau of Standards, Washington, D. C.
Technical Director, Mr. Willard Bascom, engineer, National Academy of Sciences, 2101 Constitution Avenue, Washington, D. C. EX 3-8100.

Mr. BALWAN. These men are members of the committee of the National Research Council of the National Academy of Sciences?

Mr. BASCOM. The National Academy of Sciences, that is correct.

Mr. BALWAN. You are not a committee member, then?

Mr. BASCOM. I have the title of technical director for that committee.

Mr. BALWAN. You are devoting full time?

Mr. BASCOM. I am a full-time employee, that is correct.

Mr. BALWAN. Do you have an office in FCDA, or is it in a building downtown here?

Mr. BASCOM. We are a private organization. We are supported by these funds which came originally from FCDA. I happen to have an office in the Dupont Circle Building in Washington.

Mr. BALWAN. How closely are you tied in with FCDA?

Mr. BASCOM. One of the reasons that we selected that building in the first place is because it was near to their previous location, Gilmarck Towers. Since then, I have been in very frequent communication with both the Washington and Battle Creek offices in person and by telephone, and I have done my best to become apprised of everything that is going on in the organization.

Mr. BALWAN. How long have you been on the job with this group?

Mr. BASCOM. Since July 1 of 1954.

Mr. BALWAN. Mr. Chairman, I have just 1 or 2 other questions, to find out exactly what Mr. Bascom's position is.

Mr. HOLIFIELD. Do you have a prepared statement?

Mr. BASCOM. Yes.

Mr. HOLIFIELD. Are there any questions on this phase qualifying Mr. Bascom?

Mr. LIPSCOMB. Mr. Bascom, did you have any background in civilian defense before you came to the advisory committee?

Mr. BASCOM. Well, not exactly. I have always thought about it and had a plan for my own family. I can't say that I have ever paid much attention to the public plan.

For example, after the Crossroads test in 1946, another gentleman and myself discussed the future of nuclear weapons. We decided that two things were pretty obvious about them. One was, they were going to get bigger; and the other was, there was always going to be some radioactivity associated with an A-bomb explosion. We decided the thing to do was to find an alternate place to live where there was plenty of water, and where you could live off the land.

And so, in 1948, I actually bought a place up on the Columbia River in Oregon for the express purpose of living there to avoid the phenomena which we now call fallout. I built a house about 100 miles south of San Francisco the following year, in 1949 and the first thing that I built was a small guest house. I said, "They will someday evacuate San Francisco, and I don't want them saddled on me. I will just move in the guest house, and evacuees can have the main house."

Mr. LIPSCOMB. You are the technical director of the Civil Defense Advisory Committee?

Mr. BASCOM. That is right.

Mr. LIPSCOMP. Of what do the technical director's duties consist.

Mr. BASCOM. Well, in our contract it is said that we will—and I can quickly read from that, I guess. That—

This committee will advise the Administration—

Federal Civil Defense Administration—

regarding major scientific problems affecting the civil-defense program and concerning which assistance is requested. Such advice shall include recommendations as to the lines of investigation that need to be pursued to comprehend the scientific factors involved, and whether conclusions and hypotheses reached are soundly based on available scientific evidence. The Academy will also advise in the establishment and coordination of working relations with various research undertakings, especially those outside of the Government. It is contemplated that this committee under the agreement will study and submit reports to this Administration on a minimum of eight scientific problems and projects submitted to it.

That presumably means for 1 year.

Mr. LIPSCOMB. From what were you reading?

Mr. BASCOM. This is our contract.

Mr. LIPSCOMB. Employment contract?

Mr. BASCOM. No. This is a letter from Val Peterson to Dr. Bronk, which eventually was incorporated directly in a contract between FCDA and the National Academy of Sciences.

Mr. LIPSCOMB. What do your duties as Technical Director consist of?

Mr. BASCOM. My job is to see that the committee is apprised as much as possible of what is going on in civil defense and to follow through promising lines of technical endeavor; that is, to determine at least for our own benefit what needs to be done so we are able to give good technical advice.

Mr. LIPSCOMB. Do you accumulate the information from FCDA and make it up in such fashion that the committee surveys your report?

Mr. BASCOM. That is one of the things that I do.

As I see our job it is to be out in front trying to see what needs to be done, instead of following exactly in the footsteps of FCDA. We think this is the way we can be most useful, by exploring new things.

Mr. LIPSCOMB. What coordination have you or what do you do in the way of research as to what the various States are doing?

Mr. BASCOM. Well, it has been spotty. There are a lot of States. In a few we have gone there and talked directly to the people at the local level.

For example, one of the things that we have done is specifically investigated and written up reports on evacuation exercises that have been held. I have here, by the way, a list of our publications and our studies.

Mr. LIPSCOMB. For instance, are you aware of or familiar with the State of California's civilian-defense program?

Mr. BASCOM. Yes, sir; in some ways. It is spotty in California, too.

Mr. LIPSCOMB. Therefore, when you testify here, you are evaluating both what is going on in the States and what is going on in the Office of Civilian Defense.

Mr. BASCOM. Well, I certainly do not pretend that I know everything that is going on in civil defense in the United States. However, to the best of my ability, I have tried to keep up with the main things that are going on; yes.

Mr. LIPSCOMB. Thank you.

Mr. BASCOM. And I might mention some of the publications which this committee has put out, and I will submit this list for the record, if you wish, which generally indicates the kind of things that we have gone into.

One is a report called Driveout, a practice evacuation in Erie County, Pa.

One was Operation Go Home, dispersal of Albany, N. Y.

Operation Scram had to do with Philadelphia.

We submitted a policy to FCDA in 1954, a progress report; a study of Operation Alert last year; an Analysis of the Public Comment on the Warning System in Washington, D. C.; a technical report dealing with Operation Teapot in Nevada.

We submitted a paper called A Research Program for Civil Defense; a paper called Civil Defense in the Arlington Public Schools; a study called Operation Green Light at Portland, Oreg.; a study of The Attack Warning System of the Metropolitan Washington Area; and a paper on A National Warning System, that is, the system as a whole.

Besides this, we have had many groups of papers which do not exactly form a report, but which together make a significant contribution, I think.

One of them is a series of proposals dealing with the fallout problem.

One thing we did was to let a subcontract to the University of Michigan to study indoor warning devices.

We have excerpted the speeches of Arleigh Burke dealing with missiles from submarines, and we have written innumerable memoranda to FCDA dealing with comments on news releases and bulletins, and so forth.

We are now engaged in a study of strategic warning in the United States.

Mr. HOLIFIELD. Mr. Bascom, that list will be received; and if you have copies or can furnish copies to us for our files, for our staff studies, it will be appreciated. However, they will not be printed in the record unless there is a request by some member, but merely for our information.

(The list of publications is as follows:)

NATIONAL ACADEMY OF SCIENCES

NATIONAL RESEARCH COUNCIL

WASHINGTON 25, D. C.

ADVISORY COMMITTEE ON CIVIL DEFENSE

LIST OF PUBLICATIONS

Driveout, Practice Evacuation of Erie County, Pa., October 17, 1954, by Willard Bascom.

Operation Go Home, Practice Dispersal, Albany County, N. Y., November 12, 1954, by Willard Bascom.

Operation Scram, Walkout Evacuation Section Downtown Philadelphia, November 23, 1954, by Willard Bascom.

**A Proposed Evacuation-Shelter Policy* prepared for FCDA, December 28, 1954.

Progress Report, January 1, 1955, by Willard Bascom.

Operation Alert, June 15, 16, 1955, by Willard Bascom.

Analysis of the Public Comment on the Warning System in Washington, D. C., Operation Alert, June 15–16, 1955, by Harold Mendelsohn.

Operation Teapot, July 1, 1955, by Wendell O. Gould.

**A Research Program for Civil Defense*, July 17, 1955.

Civil Defense in the Arlington Public Schools, September 7, 1955, by Robert Czapiewski.

Operation Green Light, The Evacuation of Portland, Oreg., September 27, 1955, by Willard Bascom.

The Attack Warning System of the Metropolitan Washington Area, October 1, 1955, by Willard Bascom and Kenneth Brickner.

A National Warning System, January 5, 1956, by Willard Bascom.

OTHER COMMITTEE STUDIES AND PROPOSALS

Informal proposals to FCDA on a Fallout Program including letters to the Weather Bureau, Governor Peterson, Applied Physics Laboratory, Ralph Spear, and the University of California.

University of Michigan *Final Report of Indoor Warning Devices for Civil Defense* with National Academy of Sciences—National Research Council.

Excerpts from speeches of Adm. Arleigh Burke, Chief of Naval Operations.

Memoranda to FCDA with critical comments on news releases, films, speeches, bulletins, personnel, etc.

Strategic Warning Study by Lewis A. Dexter. [In progress.]

Book, Non-Military Defense of the United States. [In progress.]

Mr. HOLIFIELD. I would say that the staff made the chairman aware of these studies and the work of this group, and in my limited judgment on the subject I know of no outside group, outside of FCDA, which has applied itself more to this problem. There may be other groups

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*Committee reports to FCDA. All others are staff reports.

which have not come to my attention, which will come to my attention during this hearing. But we felt that Mr. Bascom's activities and his interest and his different reports on this would qualify him as a witness along with his superior, Dr. Tuve, who is also going to follow him.

At this time, sir, you have a prepared statement, I believe.

Mr. BASCOM. Yes, sir.

Mr. HOLIFIELD. Would you like to present it to the committee?

Mr. BASCOM. I would, and I would also like to point out that our committee has been careful not to talk to reporters. We have never made a public statement before. I have been subpenaed and asked to come up here, so that this is the first statement which has been outside of the fairly immediate Government of the United States.

Mr. HOLIFIELD. The chairman will say this: That the chairman exercised his judgment in issuing a friendly subpena to these gentlemen, because I wanted them to be responsive to our questions without reservations which they might have to members of their organization. I felt that it might embarrass them, some of the questions we might ask; and at the same time I felt that in the public interest the committee should have a frank answer to any questions which you gentlemen have.

Mr. LIPSCOMB. Mr. Chairman.

Mr. Bascom just indicated that he was speaking for the committee, and I understood him to say at the beginning of his statement that he was speaking only as an individual.

Mr. BASCOM. I said I was speaking for the committee. What I thought I said was that I was certainly not speaking for the National Academy of Sciences, but that I believed most of the committee members will subscribe, except in minor details, to the things that I will say.

Mr. RIEHLMAN. I think it would be well to clear at this point, Mr. Chairman, before we get into any detailed questioning of the gentleman, whether or not your statement has been cleared by the members and they know what your presentation is today.

Mr. BASCOM. As to this exact wording, they have not seen it; but for very similar statements on repeated occasions, they have seen them, and I feel sure that there will be no dissent.

Mr. RIEHLMAN. Then you want us to accept this as a statement on your own; but you want us to understand that it is your feeling that the rest of the members would concur in your general statement.

Mr. BASCOM. That is correct, sir, and I suggest that you question Dr. Tuve afterward about what I have said, to see if this is his feeling, too.

Mr. LIPSCOMB. Just one further question. Does the whole committee know that you are making this presentation, and that perhaps they are subscribing to it?

Mr. BASCOM. Yes, sir.

Mr. LIPSCOMB. They have all been informed of your appearance here?

Mr. BASCOM. Well, one of them was intending to go abroad; he may not have heard about this.

Mr. HOLIFIELD. But generally you have made an attempt to contact and inform them, and, as you say, the views that you express are in the main subscribed to by other members——

Mr. BASCOM. That is correct.

Mr. HOLIFIELD. Of your group.

I will say this much, that if any of your group does have reservations, they will be given an opportunity to present any statements they wish, different from yours; and, with the acquiescence of the subcommittee, we would have any information which they might give us printed in the formal hearings immediately following Mr. Bascom's testimony and Dr. Tuve's.

Proceed, Mr. Bascom.

Mr. BASCOM. If war should come, millions of people may be needlessly killed and the war actually lost because our military defenses are not backed up by an adequate civil defense.

Much of the difficulty is traceable to the erroneous concept that civil defense is a State and local problem. It is not. An attack on any part of the country is an attack on the United States as a whole, and as such should be defended by the whole United States; the Federal Government is clearly responsible.

The public can scarcely be expected to have confidence in the present leadership when they turn to Washington and see that Congress does not provide for its own protection or participate in test exercises; they see that the executive branch gives only lip service to its own talk of dispersal and continues to build its buildings and let contracts in critical target areas; they see that the Capital City itself has no real civil-defense program—and budgets CD at one-sixth the cost of its zoo.

The lack of any substantial national civil-defense effort is remarkable, since military men have testified that our defenses—which are made up of radar lines, of fighter aircraft, of Nikes, and other missiles—could bring down perhaps seventy percent of attacking aircraft. Against the very serious threat of missiles from submarines, our defenses are meager. And against the incipient intercontinental ballistic missile—in perhaps 5 years—there is no known defense.

Our military program costs us $35 billion a year. For the protection of the public against the 30 or more percent of the attacking aircraft which can get through our defenses and against missiles launched from submarines and/or other continents, the FCDA is asking $125 million this year—twice that of last year, but only four-tenths of 1 percent of the military budget. If the danger is really great enough to warrant the huge military sum, we should critically ask ourselves why substantial measures to protect the civil population are not being taken.

The President has said that—

> Cities are the special target * * * of some modern weapons * * * and are moving into the frontline.

Defensive measures must be planned which have as little regard for internal political boundaries as have the damaging effects of multi-megaton nuclear weapons; only the Federal Government can do this. The actions required are inconvenient and expensive—but bearable.

Nuclear weapons, missiles, war itself, seem unreal. The public is simply not well enough informed to demand protection for itself. Therefore, responsible authorities must recognize the danger and make provision for national protection. The circumstances of a war's beginning or of the survival of the United States as a free nation may well hinge upon an effective nonmilitary defense program.

The present group has fallen down pitifully in the development of an organization or a plan which would be really effective in time of emergency. Let me illustrate with some specific examples of technical problems which could be solved by an intensive effort.

NATIONAL POLICY

The formulation of a national policy and the distribution of adequate technical data on which local plans can be based is a responsibility which has not been met.

From the many possible sets of planning assumptions, one has been selected in which manned bombers are assumed to drop single thermonuclear weapons in the center of target cities which have received 1 to 3 hours of warning. Practically all defensive plans which have been suggested—such as evacuation—are intended to counter that particular threat. Against other forms of attack these plans may be worse than useless.

Broader and longer range planning assumptions are needed which will give planners some opportunity to overtake the steadily increasing problems of protection.

Far to little has been said about means of protection from the threat of the missile from submarines or the intercontinental missile, although we will unquestionably face both in a few years. In the era of missiles we can expect somewhat less than the largest weapons, considerable inaccuracies with respect to the intended target, and little, if any, warning time.

If there is to be any acceptable civil defense in that day, preparations must be started at once. The present assumptions and plans will not be valid then, if indeed they are not obsolete already.

Planning assumptions are, by nature, highly speculative—consequently, the attachment to any particular one—such as the largest size weapon the AEC will admit to—makes little sense.

Survival of the country and the individual will require that people be dispersed and be able to take to shelter close at hand on a few minutes' warning.

Now I would like to simply look at some of the FCDA planning assumptions to partly illustrate the things that I have been talking about here. My objection really is not so much to the text of the assumptions themselves as to the fact that FCDA does not seem to believe them itself and use them in its own studies.

Mr. BALDWIN. Can you identify what you are reading from?

Mr. BASCOM. This is the FCDA planning assumptions for fiscal year 1956. This is the current series, and I will pick appropriate snatches from this, if you don't mind.

Mr. BALDWIN. Mr. Chairman, may I interrupt a minute here?

It would be advisable, if he is going to be reading from parts of this, that we might want to insert it in the record so it will not be out of context.

Mr. HOLIFIELD. How extensive is it?

Mr. BASCOM. It is not very long. The total length of it is perhaps three pages.

Mr. HOLIFIELD. I think, in fairness to the FCDA, that we should have a copy of this to insert in full in the record at this point.

Mr. BASCOM. I think that is reasonable.

Mr. HOLIFIELD. And then you can use such excerpts as you wish to point out. (See appendix, exhibit 1, p. 249.)

Mr. ROBACK. May I ask, Mr. Chairman, are these planning assumptions a yearly publication which sets forth the intended program for the year or is this the only one?

Mr. BASCOM. No. They come out every year. This particular set came out, as I remember, in May of last year, and it is for fiscal year 1956. Presumably there will be another set coming out before long.

Mr. ROBACK. To whom are those statements distributed?

Mr. BASCOM. This is called Advisory Bulletin 187. This is perhaps a more correct name for it. They are very widely distributed. I do not know what the list is.

Mr. HOLIFIELD. Presumably they are sent to cities.

Mr. BASCOM. This is supposed to be the basis for planning throughout the country.

Mr. HOLIFIELD. I see.

Mr. BASCOM. Item (*a*) under this:

It is assumed that if the United States is attacked, the principal weapons will be nuclear bombs of varying sizes delivered by aircraft or by submarines.

I submit that in actually implementing the assumptions, they have very much neglected the second part of this, which says: "or by submarines."

Mr. LIPSCOMB. Would you clarify that, please, what you just said?

Mr. BASCOM. I went through that a moment ago.

Mr. LIPSCOMB. What was your criticism of the planning?

Mr. BASCOM. Well, if I can read a little bit further, it will probably clear itself up.

Submarine attack connotes a slightly different sort of attack, against which one should take different sorts of defensive measures. The characteristics of submarine attack, presumably with missiles carrying nuclear warheads, would be such that cities are in the extreme danger which are within a couple of hundred miles of the coast. These missiles would be somewhat smaller than the ones that might be expected to be carried in a manned aircraft. They would certainly be less accurately directed, and the warning time would go almost to zero.

The implication of this is that for coastal cities, you may not have any warning time at all, and consequently, you had better have some kind of a plan which prepares for that. And since they are put on an equal basis in item (*a*), it seems to me that there might be equal plans for these two major difficulties which are to be faced.

Mr. ROBACK. Are you suggesting, Mr. Bascom, that the warning time for a submarine is less than for an airplane?

Mr. BASCOM. Yes, sir; and if I can read the next little piece, FCDA is suggesting that, too.

Nuclear weapons might be launched by submarines off our coasts, and from the standpoint of warning, the mode of delivery affects civil-defense planning.

Of course, also the mode of delivery affects the accuracy of the weapons, too. It doesn't say that, exactly.

Another point in the planning assumptions, it says:

We must be prepared to meet a flood of false rumors disseminated by word of mouth, by leaflets, and by clandestine radio.

I don't believe I have ever heard of anything having been done in that particular field. And in an item about fallout on the next page, it refers to "considerable areas downwind from the burst."

By itself, that is not so bad. What it indicates is a state of mind in planning these things; that they are talking about one big weapon landing in the middle of a city, and there is some definite pattern which will be involved in the fallout. It says, and I quote:

> Since no one can predict where the enemy will strike, and since radioactive fallout will not be confined to the larger industrial centers, every community, large and small, should be prepared.

As of now, there is no Federal plan, to my knowledge, on that point.

A little bit later on it says:

> Mutual aid will not be sufficient. Both mobile and fixed support will be required.

And to follow a little bit further with that, it says:

> Assistance to attacked communities must come from the outside, possibly from great distances, must be organized in advance of an attack in order to be available when required. This means that the available resources of the entire country outside potential target areas, as well as within them, must be geared into the civil-defense system.

I would subscribe to that a hundred percent. The difficulty is that with the present State responsibility and the present Federal plans, I do not think it is possible to do that.

Mr. HOLIFIELD. In other words, that plan does not exist nationally.

Mr. BASCOM. Not to my knowledge.

Mr. HOLIFIELD. Nor has that assumption of responsibility by the Federal Government yet been made.

Mr. BASCOM. That is correct.

Mr. HOLIFIELD. Proceed.

Mr. RIEHLMAN. I would like to ask Mr. Bascom just this question, because I think we would like to clarify it for the record.

Mr. Bascom, when you started your statement, you said this is a report gotten out by the Federal Civil Defense Administration, and then you say that they do not even believe what they put into their report.

Why do you say that? How can you substantiate it?

Mr. BASCOM. Well, I am basing this on what has been done as against what they have said should be done.

Mr. RIEHLMAN. Do you mean to tell us that the suggestions which are in that folder, some of which you have read, that nothing has been done about them?

Mr. BASCOM. I certainly wouldn't say that nothing has been done, but I would say that no substantial effort has been made.

Mr. RIEHLMAN. I just question your statement when you say they do not believe what they are suggesting.

Mr. BASCOM. I thought I said they apparently don't believe this.

Mr. RIEHLMAN. All right, if you want to use the word "apparently." I do not like to have it put on the record, and I do not think you would want it said, that they do not believe what they are saying; that they are trying to tell the people one thing, suggesting something for the people, and do not believe it themselves.

Mr. BASCOM. This is the way it seems to me.

Mr. ROBACK. Mr. Bascom, from your experience with underwater operations, why, in the nature of the case, would a submarine attack be more sudden or unnoticed than another kind of attack?

Mr. BASCOM. That is not a subject that I can go into here on an unclassified basis. I would be glad to talk to you about it some other time.

Mr. ROBACK. Do you have technical information on that point?

Mr. BASCOM. Yes, sir.

Mr. ROBACK. Have you ever discussed that matter with the FCDA?

Mr. BASCOM. Yes, sir.

Mr. ROBACK. And you are stating or you are interpreting their statement to mean that a submarine attack would be more sudden than an air attack?

Mr. BASCOM. I do not remember that anybody of any authority in the Government has ever questioned that. There is no doubt of that point. A submarine attack would very likely be a completely surprise attack.

These statements, of course, do not predict that these things will happen. They only talk about what could happen, and to some extent about the probabilities. You cannot consider any one little piece of an attack. You would have to think about all the enemy's problems at once.

Mr. ROBACK. Would a submarine attack, under this concept, be a single submarine, or would it be, presumably, a whole fleet or flotilla, or whatever you call submarines—in a pack. I guess it is.

Mr. BASCOM. Mr. Burke has stated publicly that the Russians have around 400 operational submarines today.

Mr. HOLIFIELD. Who is Mr. Burke?

Mr. BASCOM. Chief of Naval Operations.

Mr. HOLIFIELD. It is Admiral Burke, is it not?

Mr. BASCOM. Yes, sir.

And in one of his speeches Admiral Burke quoted a Russian admiral, who was boasting that their submarines had the capability today of delivering nuclear missiles at near-coastal cities.

Mr. RIEHLMAN. Do you know of any defense we have against that?

Mr. BASCOM. Yes, sir, but I cannot discuss that. It is classified, of course, like other continental defense information.

Mr. HOLIFIELD. I do not think this particular line of questioning as to the type of defense should be pursued in open session.

Mr. RIEHLMAN. I am not trying to press him, Mr. Chairman, to give us the information. I just want to find out if he knows whether or not we have a defense against that type of attack.

Mr. BASCOM. I think I know something about it.

Mr. RIEHLMAN. All right. That is all I want to know.

Mr. HOLIFIELD. I also think the question as to whether they would attack as a single unit or as a fleet is something which is beyond the capacity of the witness. I am not saying this in an unkind manner, but I think that depends upon the strategy of our enemy.

Mr. BASCOM. Yes, sir.

Mr. HOLIFIELD. And it is something which the witness is not qualified to answer.

Mr. RIEHLMAN. I think he is testifying, Mr. Chairman, that he knows what is being done to protect our country against this type of an action, and I think it is fair that we know whether he is basing it on a mass attack or a single attack. I think the question is pertinent to what has been said, as far as I am concerned.

Mr. BASCOM. As I said before, all planning assumptions are highly speculative. You must simply choose from among them what seems to be the most probable situation you will face.

Mr. HOLIFIELD. Mr. Lipscomb, you had a quesiton.

Mr. LIPSCOMB. Mr. Bascom, are you reading from a planning manual?

Mr. BASCOM. I was reading from this one over here.

Mr. LIPSCOMB. What were you reading from?

Mr. HOLIFIELD. Planning Manual 187, was it not?

Mr. BASCOM. Federal Civil Defense Planning Assumptions.

Mr. LIPSCOMB. What was the date of that?

Mr. BASCOM. It is just dated 1956, but as I recall the date it came out, it was about May of last year.

Mr. LIPSCOMB. 1955?

Mr. BASCOM. Yes, sir.

Mr. LIPSCOMB. And do you believe that they base their planning data or their planning on the amount of money which they think they are going to get to operate with? Does that have anything to do with it?

Mr. BASCOM. Well, I hope not. I do not think they do. My quarrel, you see, is not really with the planning assumptions, but really whether the things which are being done really follow through with the planning assumptions.

Mr. LIPSCOMB. If they had enough money to follow through on that, they might be able to go through with all these things in which I feel they believe.

Mr. BASCOM. No, sir; I don't think I could agree with that. I think the money they have, if it was spent for planning, would be ample. It is certainly not enough to give us a civil defense in this country, but it is ample——

Mr. LIPSCOMB. All the money cannot be spent on planning. Some of the money has to be spent on supplies and other things.

Mr. BASCOM. I question that you know what supplies to buy until you have made substantial plans.

Mr. LIPSCOMB. But you grant that if they had all the money they need, that they could go ahead with all the things that you are talking about?

Mr. BASCOM. No; I wouldn't grant that. I would like to go through the rest of the items, first, before we discuss that, though, if I may.

Mr. LIPSCOMB. I disagree with your statement.

Mr. BASCOM. All right. And this other piece that I have here also deals with planning assumptions, and this is from the Survival plan work book.

Mr. HOLIFIELD. What is the date of the issuance of that, please?

Mr. BASCOM. This is December of 1955. It is M27–2.

Mr. HOLIFIELD. Thank you.

Mr. BASCOM. My objection to this is that they have put, to my way of thinking, planning assumptions on a "do-it-yourself basis," and I simply don't think that this should be done. In other words, they are leaving it up to individual cities to determine what the difficulties are. And I think this, more than anything else, is the responsibility of the Federal Government today.

Mr. LIPSCOMB. Mr. Chairman.

Are you not discussing the law? I mean, the way the law is set up, the planning is by individual cities. There must be a need for a change in the law to go along with your idea.

Mr. BASCOM. I do not think that is correct. It is true that the law states that most of the problem is with the States, but it seem to me that the furnishing of technical guidance to the States, at least furnishing warning to them, is very much a Federal responsibility.

Mr. LIPSCOMB. But they set up the planning, and then the States have to do it themselves, basically, right now.

Mr. BASCOM. Let me just read this sentence, please. It is called tentative planning assumptions, and the sentence is this:

The tentative planning assumptions should be made with the understanding that facts developed by the study may well necessitate a revision of the assumptions.

I frankly never heard of such a thing, that as you go along you revise the assumptions to fit what you find out. You either start with assumptions or you don't start with assumptions, to my way of thinking.

And another one which is similar, just to show the character of the thought, says:

Weapons in the megaton range are suggested for most critical areas.

Well, now, these are not planning assumptions which I think I could use to make a plan on if I had the problem as a city civil defense director.

Mrs. GRIFFITHS. Mr. Chairman, do you mean that that is the information which they are supplying to the cities to make the plan from?

Mr. BASCOM. Yes, ma'am; I quoted from their manual.

Mrs. GRIFFITHS. That is what they are supplying to the cities and saying, "Now, you make a plan; go along with this."

Mr. BASCOM. That is right.

Mrs. GRIFFITHS. I see.

Mr. BASCOM. When I first came to Washington I was most disturbed by the fact that there seemed to be no national policy that I could recognize, and I tried in my own mind to think what it should be. Not long after that it turned out that a special committee of the President, called the Killian committee, was meeting here. As it turned out, three of the members of that committee have become also members of our advisory committee.

Mr. HOLIFIELD. And we have Dr. James Killian, president of MIT, scheduled as a witness.

Mr. BASCOM. That is right. And one group in the Killian committee was disturbed by this planning—this sort of lack of policy on the part of the Federal Government, so in close collaboration with them we prepared a statement which evaluated, as well as we could, what the threat was and what should be done about it. We prepared this and issued this as a sort of a memorandum, and turned it over to Mr. Val Peterson in, I think it was, December of 1954.

It generally says the kinds of things we think should be said in a planning statement; it deals with the various sorts of weapons and various kinds of delivery methods likely in the next few years, and it goes into some detail about these things. I submit that for the record but I would rather not discuss it for the moment.

Mr. HOLIFIELD. Is this classified or unclassified?

Mr. BASCOM. It is unclassified.

Mr. HOLIFIELD. It will be received for our files, but not printed in the record.

Mr. BASCOM. This is called A Proposed Evacuation Shelter Policy.

Mr. BALWAN. This is prepared by the committee?

Mr. BASCOM. Yes.

Mr. BALWAN. You mentioned something by the Killian committee.

Mr. BASCOM. I prepared this in the beginning at the behest of a group in the Killian committee who eventually became members of the NRC advisory committee.

Mr. BALWAN. Who were the members who became members of your committee?

Mr. BASCOM. Mr. Tuve, who is here this morning, Dr. Scoville and Dr. Emberson of Associated Universities and East River project.

Mr. BALWAN. They were members of the Killian committee?.

Mr. BASCOM. That is correct.

Mr. BALWAN. Will you explain for whom the Killian committee was organized?

Mr. BASCOM. I can't very well. I think it would be much more appropriate to ask Dr. Tuve when you talk to him later on.

Mr. BALWAN. Thank you.

Mr. BASCOM. I would like to go on to the next subject if I may, which deals with warning.

Unless people are properly warned of an impending attack, civil defense is largely a pick-up-the-pieces operation, for individuals cannot take protective action without some warning.

Therefore the installation of a system whose objective is to alert substantially everyone in the country within 5 minutes of the detection of any enemy attack is a prime responsibility of civil defense. If people do not wish to act on the warning that is their own business—but they must be given the chance.

The United States is investing billions of dollars in the development of the Distant Early Warning (DEW) lines of various sorts—including three lines of radar, Lofar, Texas towers, the destroyer pickets and so forth.

This will alert our military forces to an enemy attack. To relay this warning to the poor taxpayers who paid for it, all civil-defense organizations together have spent a total of about 16 millions.

The efforts of civil-defense authorities to date have not succeeded in producing anything like a warning system which will be adequate in the rapidly approaching era of ICBM's—intercontinental ballistics missiles—when only a few minutes will be available for action.

The old concept of warning only those who live near the centers of so-called target areas is not acceptable. Bombs in aircraft which are brought down by our defenses may explode and missiles from submarines or other continents may go wild and miss their targets by many miles, direct effects of an explosion may reach out 50 miles; fallout goes much farther. Everyone is in danger.

And I think they should all be warned.

Warning methods can be put into two general classes: (1) public outdoor devices which indiscriminately reach as many people as possible and (2) specific (indoor) devices which alert households, institu-

tions or business establishments where the outdoor warnings would not be heard or are impractical to install.

Mr. HOLIFIELD. Will the witness pause at that point. Under the date of January 6, from David M. Dennison, chairman of the department of physics, University of Michigan, the committee has a letter commenting on these interior warning devices which the gentleman mentioned.

And he says his principal consideration has been the study of the technical aspects of warning devices. "The conclusion to which our subcommittee—referring to the civil defense advisory committee of the National Academy of Sciences—came was that warning devices were perfectly feasible either through special radios or through power company or telephone lines.

"The difficulties appear not to be technical, but rather financial and, to some extent, considerations of convenience or inconvenience to the utility companies."

And that is from Dr. Dennison, chairman of the department of physics. I thought that was pertinent to your testimony.

Mr. BASCOM. We should say a *system* is required which combines the indoor and outdoor devices. It must operate on a national basis so it is as independent of political boundaries as are the telephone and radio systems today.

Mr. RIEHLMAN. Apparently there has been a study made of this problem, hasn't there?

Mr. BASCOM. There has been a study made of available interior warning devices. That isn't the basic part of the problem. The problem is how you make a system out of these and make the people believe it.

I would like to mention a booklet put out by the survey research center of the University of Michigan, a different part of the university than that Dr. Dennison is in. From it you can get some idea of the problems involved. It is entitled "Public Reaction To a Surprise Civil Defense Alert."

On May 5 last year there was a false alert on the west coast which caused considerable difficulties. Two groups were invited to study it, one from Stanford Research Institute and one from University of Michigan. The Michigan people found that in the city of Oakland three-fourths of the people heard the siren; 1 out of 4 did not hear it.

Fifteen percent believed it was an air raid warning, 10 percent thought it might be a warning but doubted it, 50 percent did not believe it, and 25 percent did not hear it. This gives you some idea of the problem.

Few of the people took it seriously at all, at the most 15 percent—and few of those took some kind of action on it. The problem is not entirely one of making a noise. It also has to do with the psychological problem of getting people to believe it, and having believed it, to do something about it.

Mr. HOLIFIELD. This is a very important point. It shows that there is a complete lack of realization on the part of the public of the possible hazard involved, and it certainly shows that the warning systems in this instance were inadequate and there is, as every witness before us has testified, the need for a tremendous educational program to acquaint the people with the hazard and with the methods of warning and the necessity for participation in these civil defense exercises.

Mr. RIEHLMAN. I concur a hundred percent in what you are saying; that is why I am anxious to find out from Mr. Bascom what suggestions he has to strengthen this situation, because it is a terrible thing to think we have a type of warning system and then the people don't believe it.

That is not good. I am very serious about it. I think we want to know what can be done constructively.

This is not trying to get you off the track of logic of thinking.

Mr. BASCOM. Not at all.

Mr. RIEHLMAN. We are really serious about it. This disturbs me. We know that the dissemination of information has not been as good to our people and we are trying to arrive at some point where we can strengthen that. This thing annoys me terribly when you stop to think that the great percentage that you suggested just don't believe it is a warning and pay no attention to it. I am not doubting your word and of the study but I think the committee wants to really put their teeth into something to help.

We are after people like yourselves or anyone else who can say to this committee these are the things we must strengthen but we must have help as to how we are going to do it.

Does it need money or what has to be done?

Mr. BASCOM. Let's talk a little more about warning while we are on that subject.

Mr. HOLIFIELD. I think this point ought to be discussed. I think it is very important. You say there has been a study by your group of Operation Alert.

Mr. BASCOM. Yes, sir.

Mr. HOLIFIELD. Which took place here in Washington and environs. Do you have comparative figures to show the participation of the people and their understanding of the warning and so forth?

Mr. BASCOM. Yes, sir, we do. We did several reports on that. As I recall that on the test during Operation Alert in Washington only 60 percent of the people heard it and we thought maybe even that was high.

Mr. BALWAN. Do you have a copy of that report you can read from or are you calling on your memory?

Mr. BASCOM. I am calling on a slightly different report. The thing seemed so bad to us at the time that we decided to make a comprehensive report of the warning system. This is called the attack warning system of the Washington metropolitan area. It was published in this form, on October 1, 1955.

Mr. HOLIFIELD. That is made by whom?

Mr. BASCOM. By the Civil Defense Advisory Committee of the National Academy of Sciences.

Mr. HOLIFIELD. Can you give an answer to my question fairly briefly as to the comparative figures that you gave on the Oakland study?

Mr. BASCOM. I can't from memory. We also have another report that deals with this and it is called An Analysis of the Public Comment on the Operation Alert—specifically with respect to the warning system.

This came about because at the time the alert was conducted there were coupons put in the newspapers to be clipped and sent in by people. The local civil defense groups here did not seem to have the

staff or the inclination to handle these so we took them and analyzed them. As I recall we analyzed 1,500 of those statements and tabulated them in this report called An Analysis of the Public Comment.

My recollection is that only 60 percent of the people heard the warning. I don't recall that anybody was asked to take action so it was hard to tell what they would have done if the chips were down.

Mr. HOLIFIELD. Outside the Government employees?

Mr. BASCOM. The Government employees took action on a different set of assumptions than the civilians so you can't very well compare the two actions.

Mr. HOLIFIELD. Both of those reports will be submitted for the files of our committee?

Mr. BASCOM. Yes, sir; they will. (See appendix, exhibit 2, p. 253.)

Mr. BASCOM. Besides this I am working on a comprehensive book on civil defense as a whole. One of the chapters completed deals with the national warning system and it goes into considerable detail about the interior devices, the relation between them and the outdoor devices and the need for a system. It also makes some approximate estimates of the cost of a system.

Mr. HOLIFIELD. Please submit that at this time if it is available.

Mr. BASCOM. Yes, sir. (See appendix, exhibit 3, p. 258.)

Mr. BASCOM. I would like to point out that although only 75 percent of Oakland heard this warning, Oakland is in very good condition compared to some other places.

We are talking about the city limits in this case. A great many places in the country are not warned at all. There is no real reliable estimate as to how many people in the country would be warned today but I would doubt that it is much over 25 percent.

The problem is how to extend the warning to those people who are not now warned and that needs to be done by a combination of devices. In some cases that will mean additional sirens or outdoor devices; in many cases interior devices will be needed to extend the siren coverage. Interior devices can be operated in several ways. The most promising device of all utilizes the radio system.

Any warning only passes a single bit of information. It says, "Do something right now,"—and then the question is, "What do you do?"

What you really need is to get to a radio and be told at the last minute exactly what you are expected to do and what the situation is.

It seems most sensible to think about warning in terms of advice that works in combination with a radio. Such devices are technically feasible and they have been presented in various forms. The problem before the Civil Defense Administration as I see it, is to make a system's analysis to determine which of these devices should be used and in what combination with the sirens.

It is true that the telephone lines and power lines could be used to pass a warning, but whether this is the best way to do it is very doubtful and this publication here, if you are interested in going into it farther, goes into the details of each of the kinds of devices which have been suggested, and there are dozens. It discusses the technical pros and cons and the need for a system. As part of the research program which we proposed last July, we stated very strongly that some group should make a system's analysis of the warning system in this country.

Mr. HOLIFIELD. That would be actually the transmission of the military warning?

Mr. BASCOM. That is right. This would be an extension of the military warning system to civilians. There is much more to this than the things we have discussed. For example, among the other things that were found out in the false alert in San Francisco was that the people who operate the warning sirens in the control centers—where these devices are tested perhaps as often as once a day to make sure they are workable—do not believe a warning themselves. After years of sitting there and watching the test signals come in and seeing nothing happen these people are conditioned to believe that the signal does not really mean an attack is imminent is an alert themselves. Instead of following through on the instructions such as, "When the light flashes red, you push the button and sound the sirens," they were very skeptical. One called the mayor to see what he should do next. So apparently clear-cut instructions turned out not to be so clear.

The warning problem is not so simple that it can be solved by money alone. A lot of thought has got to go into creating an effective system.

Mr. RIEHLMAN. Isn't it very important that we have people that are well trained in that type of an activity and ones that we can definitely depend upon for that type of assignment, who will not question when a red light comes on.

Mr. BASCOM. A better solution is to have it made automatic so you don't have to have any human decision at the last moment. This is possible too.

Mr. RIEHLMAN. That is a good suggestion. I am wondering how far we can go with that type of an automatic system throughout the Nation for warning. That is the problem we are faced with.

Mr. BASCOM. That is exactly the problem. That is the reason we have suggested that a technical group put a lot of time and man-hours figuring out how you do this. Anybody is foolish to talk about pat solutions in this business. We are indicating the lines of effort that should be pursued if we are to get what we need.

Mr. HOLIFIELD. This is a wide field and I notice under Conelrad you comment further in your statement on this.

We have had a request from a witness to appear before us on this subject and he is advocating a device that ties in with the light systems as a supplement to the radio.

As you say there are a number of those devices and we will be glad to have that particular study for the staff and the members to look at.

Mr. BASCOM. Possibly for your information you might like to have this one page in here which lists the various possible kinds of devices.

Mr. HOLIFIELD. That will be good. We can put that much in our record at least. Read it.

(The document referred to is as follows:)

[From Chapter III of the Non-Military Defense of the United States]

TABLE 2.—*Proposed Warning Devices*

OUTDOOR	INDOOR
Sirens	Powerlines
Jet engines	Frequency shift
Horns (electronic)	Carrier system
Horns (compressed air)	Voltage drop
Horns (aircraft carried)	Subharmonic
Whistles	Voltage spike
Bells	Signal to turn on existing radio
AA guns	Telephone
A-bomb	Bell and light system
	Conference circuit
	Direct call (including party line)
	Ring all phone bells:
	with a special ring
	give recorded message
	Use of telephone wires to sound signals other than telephone bell
	Radio, AM broadcast band
	(All AM, FM, and TV goes off the air under present regulations and thus gives a sort of warning)
	Constant monitoring of coded alert
	Induction-field radio
	Use of "Collegiate broadcast system"
	Focused siren
	Water pipes
	Gas pipes

In the entire United States—
96 percent of households have electricity (over 90 percent of these have 60-cycle AC)
94 percent of households have radio
69 percent of households have telephone
In target areas (critical target areas have slightly larger percentage):
99 percent of households have electricity
97 percent of households have radio
76 percent of households have telephone
(One hundred and seventy thousand people in the United States are totally deaf. 15 million have some hearing impairment.)

Mr. BASCOM. The list is divided into the proposed warning devices; outdoor and indoor. Among the outdoor devices are: sirens, jet engines, electronic horns, compressed-air horns, aircraft-carried horns, whistles, bells, antiaircraft guns, and "A" bombs. Yes, even those have been suggested.

Mr. HOLIFIELD. Those are outdoor warnings I understand.

Mr. RIEHLMAN. One A-bomb would alert us.

Mr. BASCOM. In the interior devices under Power Lines, that is the ordinary building current, we have: the frequency shift method, the carrier system, voltage drop, subharmonic system, voltage spike and a signal to turn on existing radios.

Under Telephone we have the bell-and-light system, an expensive restricted form that is in use already, the conference circuit, the direct call including the party line ring all telephone bells with a special ring or recorded message or one could use the telephone wires to sound signals other than the telephone bell.

Under Radio in the AM broadcast band under the present regulations all AM, FM and TV goes off the air on the alert and that constitutes a sort of a warning if your receiver is on.

Mr. HOLIFIELD. If you realize that all radio goes off the air.

Mr. ROBACK. Rather than your set going on the blink.

Mr. BASCOM. Then the constant monitoring of a coded alert, induction—field radio, and "the use of the Collegiate broadcast system." As another major heading there is the focused siren which is a sort of funnel which picks up the siren and aims it at you specifically.

There have been suggestions that the water pipes and gas pipes might be used in some ways to pass the warning too, I have not heard any specific details. There is quite a spectrum of possibilities. Most of these are analyzed in this publication I have here.

Mr. BALWAN. Has the National Research Council studied this warning system?

Mr. BASCOM. The studies we have made are distinctly preliminary. We got the University of Michigan to study interior devices.

Mr. BALWAN. It is not the function of NRC to make these studies?

Mr. BASCOM. No, sir. We don't do research; we do staff studies which indicate which things should be done.

Mr. BALWAN. You are pointing up the problems?

Mr. BASCOM. That is correct.

Mr. BALWAN. Have you recommended to the FCDA that the problem be handled that you are pointing up?

Mr. BASCOM. I will come to that in a moment. That is in our statement of a proposed research program which they have had for around 7 or 8 months.

Mr. BALWAN. They have had?

Mr. BASCOM. Yes.

Mr. ROBACK. You made a reference to personnel at warning centers; were you referring to personnel under military direction?

Mr. BASCOM. This is another point that is confused at the moment. In many of the air defense warning control centers, the arrangement is such that there is a civil defense man on duty perhaps 40 hours a week, a regular workweek. When he is there, he presumably prefers the function of passing the warning along. At other times this job is taken over by some military man who is in the office there anyway so it is not a clearcut division of responsibility.

Mr. ROBACK. What is the rationale as you understand it of having a civil defense man in a military center, does he have to push one button and the military pushes another button?

Mr. BASCOM. I don't think I want to go into that right now since I am not terribly well informed on that point. In the Seattle, Wash., area I am told there are three possible ways the warning can come to the man who pushes the button for the siren. Sometimes they get one and sometimes they get three. It is different every time. It is not a clearcut responsibility. The Stanford Research Institute Study made of the May 5 false alert pointed up this difficulty very clearly—this division of responsibility in the control centers.

Mr. HOLIFIELD. As I understand you to say, there are Federal Civil Defense Administration employees in military warning centers?

Mr. BASCOM. Yes, sir.

Mr. HOLIFIELD. Do you know whether they are in all military warning centers?

Mr. BASCOM. I don't know.

Mr. HOLIFIELD. Do you know whether they are there on an 8-hour basis or 24-hour basis?

Mr. BASCOM. My impression is that it is different in various centers. Some may be staffed on a full-time basis, others are not.

Mr. HOLIFIELD. They are on a part-time basis. Then during the hours in which they are not on duty, they must be there for a purpose. If they are there 8 hours out of the 24 and the other 16 hours they are not there, it would be evident that the purpose for which they are there is not being performed as acceptably as if they were there, assuming that they do have a purpose and do fulfill the purpose.

Mr. BASCOM. I am not sure of the details of what their other purposes are so I could not subscribe to that statement without studying it more.

Mr. HOLIFIELD. The chairman will make that as an assumption on his own, as long as we are dealing with the substance?

Mr. BASCOM. I suppose while we are on warning it might not be amiss to point out that this is one—in fact it is the first item—in a research program for civil defense, which our committee proposed to the Civil Defense Administration on July 17 of last year. In that we have described generally the functions of operations research organizations—that is technical groups in the universities and research institutes of the country which make technical studies on a highly specialized area.

A systems analysis examines all the possible actions and devices that can be used and from among the many possibilities determines the most effective combination.

We strongly recommended a 12-point program to FCDA of operations research which would look into every aspect of civil defense; and item No. 1 on that list was warning systems.

Mr. BALDWIN. Why did you recommend that FCDA contract this out through operations research in the universities instead of doing it themselves? I think they have a warning staff there.

Mr. BASCOM. They do have a warning staff but I think it is correct to say, they are not able to do this kind of work. I don't think they would argue with that.

This is a complex business and it requires completely unbiased people who have no pressures on them to decide which is the best of the systems to be used. FCDA is understaffed technically in almost every field and they simply don't have the staff facilities or the technical people to make such studies.

Mr. BALWAN. You think if they had such a staff it would be more desirable to do this work within FCDA? I am trying to distinguish as to why you are making that recommendation, whether there is an intrinsic merit for it being in FCDA or practically it should go outside or whether it has intrinsic merit for going outside in the first place.

Mr. BASCOM. I think there is intrinsic merit in going outside. It is best to refer to the experience of the military organizations.

Mr. BALWAN. That is, it has no relation to the money or time that the people in FCDA have?

Mr. BASCOM. That is correct. It is better generally. The Defense Department has a Weapons Systems Evaluation Group. The Navy has Operations Evaluation Group, the Air Force has Rand and so forth. Such work can better be done outside.

Mr. BALWAN. It is not a criticism of the people in FCDA but it is an accepted practice that even the military departments have adopted.

Mr. BASCOM. That's right.

Mr. HOLIFIELD. I think that principle is well established so we will pass right on.

Mr. BASCOM. The next item I have here deals with the reduction of urban vulnerability.

Every responsible group that has studied the civil-defense problem has recommended that steps be taken to alter the vulnerability of cities to (1) reduce their target attractiveness and (2) lessen the chances of complete destruction in an attack.

I do not believe that FCDA has a group giving full-time attention to these matters today. In other words, the defensive measures which would give long-term protection are being neglected in favor of short-term measures of dubious value.

Some examples of possible measures for reducing vulnerability of cities are: (1) The alteration of building codes to provide for wider streets (which would be effective as firebreaks and could not be completely clogged with rubble); (2) The requirement that new buildings have suitable shelters built in—possibly used for utility areas in normal times; (3) A program of slum clearance replaced by parks or garden apartment strips across which fires could not spread; (4) The construction of deep underground garages which would make good shelters; (5) The development of radial subways for autos or trains which would give better transportation (and thus encourage people to live in more dispersed locations) and at the same time would provide continuous shelters and underground escape routes; (6) The planning of urban development instead of allowing it to spread erratically and produce new problems; this planning would provide for the dispersal of new industrial facilities, Government buildings, etc.

These measures might be fostered by tax allowances, by requirements in Government and military contracts, by special legislation, and even by subsidies so that structures with defensive advantages are competitive with normal building. The basic idea is to utilize the natural development and growth of the United States in such a way as to produce built-in features which are necessary for civil defense.

Mr. HOLIFIELD. Can we go back just a moment here to the bottom of the top paragraph of that same page? You say:

> I do not believe that FCDA has a group giving full-time attention to these matters today. In other words, the defensive measures which would give long-term protection are being neglected in favor of short-term measures of dubious value.

Would you care to tell us or elaborate on the short-term measures of dubious value?

Mr. BASCOM. I was thinking about the difficulties in justifying evacuation as more than an interim measure and I would like to discuss that under evacuation later on:

Much of this has been fumbled by the Federal Government in the sense that dispersal, which is one of the main features in reducing urban vulnerability, has been in the Office of Defense Mobilization. They have been specifically charged with industrial dispersal. It has not been clearly specified who is to handle the other aspects of

the dispersal, including the reduction of building and population density, but it seems to me to be a civil-defense problem.

A few weeks ago the authority for industrial dispersal was delegated back to FCDA.

Mr. HOLIFIELD. That may have been because they adopted a policy of reducing tax-amortization certificates at this time. I would like to just ask you this. Do you feel that the FCDA should control the granting of tax amortization or they should set up criteria and let an operating agency like the ODM possibly execute it.

Mr. BASCOM. As it is presently set up under the law I don't think they can do either. It seems to me one thing they should do is to be planning and anticipating what needs to be done. If the things that need to be done are not in their law, they had better propose measures that should be in their law, and this is one of the measures about which I am talking.

Mr. LIPSCOMB. Could you explain how you would expect this to work? What would be the procedures for introducing some of these measures, for instance, the alteration of building codes to provide for wider streets?

Just to follow it through from the Federal level.

Mr. BASCOM. I am mainly talking about the Federal people doing planning. If there were measures which clearly had the support of the Federal Government and which offered some inducements to individual cities to alter their own building codes in this manner, I think that would be a big help.

I don't see any way that the Federal Government has any control over local building codes. But there is an opportunity to suggest what should be done about them. Very few cities know what sort of action to take.

Mr. HOLIFIELD. You are suggesting then what should be done, not the methods of accomplishing it?

Mr. BASCOM. I am not a lawyer, but I have a feeling that they can be done.

Mr. HOLIFIELD. You are suggesting what you think should be done?

Mr. BASCOM. Yes, sir.

Mr. LIPSCOMB. He was saying these measures might be fostered by tax allowances, by requirements in Government and military contracts, by special legislation.

Mr. HOLIFIELD. That is the way we have tried to do it.

Mr. BASCOM. That is right.

Mr. HOLIFIELD. Our tax-amortization provisions were based, as I understand it, on defense needs, during the war and subsequent to the war.

Subsequent to the war, it was supposed to be based mostly as I understood it on dispersal and then by Government contracts we have frequently granted tax amortization to people on the buying of tools and on the setting up of their buildings; and at that point the Federal Government could require as a requisite of getting that tax amortization that certain FCDA criteria be observed or else they would not be eligible for it.

Mr. BASCOM. My thought is that the criteria should be whether the present laws are effective, not whether there are laws in existence that could be used. If the present laws are not working, then the situation should be corrected.

Mr. HOLIFIELD. That would require special legislation.

Mr. BASCOM. I presume so. I didn't suggest that I would write the legislation.

Mr. HOLIFIELD. Not only on the Federal level but on the State level in regard to building codes and so forth.

Mr. BASCOM. Whatever seems to be necessary after a study is made by a thoroughly experienced group in this matter.

Mr. HOLIFIELD. Tax amortization would be Federal and building codes would be local.

Mr. LIPSCOMB. I was inquiring about this special legislation, wondering whether you thought the Federal Government would pass some kind of a law forcing the States, cities and counties to do these things.

Mr. BASCOM. I didn't mean that sort of thing.

May we pass on to the next item?

Mr. HOLIFIELD. I think the matter of compulsory participation in defense, in nonmilitary defense would require very serious study. One possibly should be made; but it would clearly come within the jurisdiction of Congress which has the responsibility for the common defense to consider that problem, consider whether it would be wise or not.

Mrs. GRIFFITHS. Mr. Chairman?

Mr. HOLIFIELD. By the way, your conclusion on that is in complete compliance with the East River Project's recommendation.

Mrs. Griffiths?

Mrs. GRIFFITHS. The Federal Government could make hard and fast rules in public housing and have a housing code as to how it will be built and what is going to be done.

Mr. HOLIFIELD. That is true. But it is not obligatory upon the locality to accept that. If they wanted that benefit, they would have to comply, they would have to readjust their codes.

This has been done in some instances. In some instances they have refused to adjust their local codes.

Proceed.

Mr. BASCOM. Shelters. The shelter is the ultimate protection of the individual in the event of attack.

A shelter protects against the initial thermal, blast, and radiation effects; cover protects people against radioactive fallout; housing protects against the weather.

Here I am only talking about the first category. Many good shelters exist already as integral parts of our cities in the form of deep basements, subways, underground garages, and so forth.

Other structures could be easily modified to make reasonably satisfactory shelters. Many need to be built for use of the employees and customers of industrial and commercial organizations and for householders.

Except for the marking of existing shelters there is no shelter program worthy of the name. The plans for home shelters suggested by FCDA are in some cases ridiculous; there have been no laws prepared (on a national basis) which would give tax or assessment benefits, or would require shelters to be built in either new or old construction, or would require federally financed houses to have some shelter facilities.

That is the point Mrs. Griffiths just made.

Mr. HOLIFIELD. I received a letter this morning under date of February 3 from Mr. Ralph W. Weymouth, Route 2, Woodenville, Wash.

MY DEAR CONGRESSMAN: I am very much interested in an AP dispatch dated January 31 to the effect that your committee is holding hearings with the purpose of informing the public fully on the possibilities of civil defense.

May I request that you send to me all of the printed reports of the hearings before your committee as they are issued, which it is permissible for the public to receive.

I am building an underground shelter on my property, which is approximately 18 miles from probable target, Seattle, at an expense of several thousand dollars, which includes standby electric plant, an air filtration system, plumbing, lighting, water supply, sewage disposal, etc.

In none of the publications of the Civil Defense Administration have I noticed proper warning of the necessity of adequate air supply and its filtration.

What is the use of getting underground if you have to breathe air containing fallout which will kill you?

Your hearings might bring out some point which I have overlooked in the design of my shelter, but which would save the lives of my family.

(Signed) RALPH W. WEYMOUTH.

This was handed to me by the staff as I came to the meeting and I thought this was appropriate to show the interest that one individual at least has in this program.

Proceed.

Mr. BASCOM. In West Germany, however, after April 1 this year all new houses in cities over 10,000 are required by law to have shelters.

Mr. HOLIFIELD. I think we might emphasize that last sentence in that paragraph by rereading it, Mr. Bascom.

Mr. BASCOM. In West Germany, however, after April 1 this year all new houses in cities over 10,000 are required by law to have shelters.

The effects of large nuclear weapons are such that shelter requirements fall into three general categories:

(1) In the crater area no shelter can be made strong enough;

(2) In a narrow ring outside the crater area a very sturdy shelter will offer protection;

(3) In a very large area a moderate strength shelter capable of withstanding up to one atmosphere of pressure (15 pounds per square inch) will give excellent protection.

During the recent Nevada tests, windows were splintered and the glass flung about in a lethal manner by 0.6 pounds per square inch (well outside the usual FCDA damage rings). The ratio of these areas in which shelter is needed is about 1:60:4,000.

Mr. BALWAN. Can you explain that?

Mr. BASCOM. We have a crater area directly underneath an explosion where no shelter can stand up. Then there is an area roughly 60 times that large in which a very good shelter would stand up. Then there is an area nearly 4,000 times that large in which a moderate strength shelter would be effective.

Mr. HOLIFIELD. That is all still in the pattern of bomb effect, the 4,000 area is assuming——

Mr. BASCOM. These figures refer to areas in which persons are likely to need some kind of a shelter regardless of the size of the bomb. They are ratios, not square miles.

Mrs. GRIFFITHS. Mr. Chairman, what is the size of the center of destruction with the largest bomb that could be dropped now? Would it be 4 miles?

Mr. HOLIFIELD. Will you change the tense of your question to the largest bomb that has been exploded?

Mrs. GRIFFITHS. All right.

Mr. BASCOM. The information that has been made available to the public is very largely that of the effects of the Ivy-Mike explosion of November 1952 in the Pacific Proving Grounds. I don't think that has ever been exactly stated what the size was but it has been said to be on the order of 10 megatons by officials.

The crater as described in those figures was something over a mile in diameter. There is a large plastic zone outside of that where nothing could survive and, as defined by the FCDA, there is a zone of complete destruction whose radius would be about 4 miles.

Mr. ROBACK. May I ask a question here, Mr. Chairman? The present supposition of that statement is that a single bomb drop in a target area in most parts of the country where the population is heaviest you would have overlapping concentric rings. What would be the application of this type of analysis in such a situation?

Mr. BASCOM. Let me finish the last sentence here and then I will discuss that.

Since we can never know where ground zero will be, a program aimed at encouraging construction of the moderate strength type seems to be the most logical balance between economics and protection, although it must be made clear that in an attack the best shelter will seem none too good.

To say that in another way, if we are going to go into a shelter program we had better place our bets on the 4,000 and get lots of shelters that will give protection over a huge area rather than get a few maximum strength shelters which give better protection in a rather restricted area.

Mr. HOLIFIELD. That argument is further buttressed by the fact that no one knows where ground zero will be.

Mr. BASCOM. That is the first sentence there, since we can never know where ground zero will be.

Mr. HOLIFIELD. That is very important in our planning. Your thought is that a reasonable type of protection should be extended to the many rather than trying to predict where point zero will be and give tremendously expensive type of protection to a theoretical point zero impact area.

Mr. BASCOM. That is correct. I have also pointed out that the shelters which I am indicating would offer excellent cover from a fallout. I believe that they can be built for something on the order of a hundred dollars per person.

Mrs. GRIFFITHS. How good a shelter is a tunnel under a navigable river?

Mr. BASCOM. There are too many speculative aspects to that question.

Mrs. GRIFFITHS. Is it at least as good as a basement or in the same area or what?

Mr. BASCOM. This depends. If a bomb landed in the water it is conceivable that the energy of the bomb would be transmitted through the water and that the tunnel would be cracked and would be flooded. I don't think that question can be answered very well. I personally would not select that tunnel if I had much other choice.

Here is a publication by the Civil Defense Administration called Shelter Designs. The cover says the following pages show four types of shelters recommended by the Federal Civil Defense Administration. There was probably a covering letter which has been lost. There is no date on here but anyhow it is a very recent publication. Some of these designs are particularly irritating. I should add that when this first came out I went to the FCDA and asked them if they ever read their own publications. What I would like to offer here is these two drawings which are a "Temporary basement corner room shelter." It is dated August 1955. So it is a fairly recent publication; it shows a collection of sandbags. The implication is that such a shelter can be built easily.

I made some interesting calculations with respect to the drawings exactly as they are shown here.

First of all it might be pointed out the drawings indicate sandbags five deep in the living room or whatever room is upstairs from the basement of your house. That might be an annoyance. In order to build this shelter 515 bags are required. The cost in Washington of bags which are suitable for holding sand is somewhere between 12 and 40 cents, depending on the mesh. So you are talking about upward of $60 on that item alone. To fill these with sand required 28 tons of sand. In order for the bags not to rot away immediately the sand has to be dry. And it requires some lumber and not to mention the time involved. A minimum cost on what they have described as a temporary corner basement shelter is $150 just for the materials. Here are the calculations.

Mr. RIEHLMAN. Do you have anything to recommend in place of that type of shelter?

Mr. BASCOM. Yes, sir; I do. Is this a good time to go into it?

Mr. RIEHLMAN. You criticized the other.

Mr. BASCOM. We might say something about the other shelters.

Mr. RIEHLMAN. Let's hear them all. We are anxious to find out what the information is that is going out to the public. If you are criticizing it you should be in a position to suggest something that is better.

Mr. BASCOM. I hope that I can. We might mention the other shelters that are in here. They are fairly complex and I have not made detailed calculations as to what the cost of building them would be. However, they are talking about something on the order of from $400 to $2,000, depending on the local situation, for shelters which might hold 4 to 8 people, something like that.

Mr. RIEHLMAN. Of course that is nothing compared to what this gentleman here is building out in the country for his protection with sanitation equipment, powerplants and all the rest for his own family.

Mr. BASCOM. Within the last few weeks I became irritated about this situation and got to thinking again about the shelter problem. I asked myself what characteristics a home shelter might reasonably have so people might be more or less encouraged to build one. I did the drawing which I will show you in a moment last Thursday and I showed it to my usual contacts in FCDA immediately afterward.

The type of shelter which I propose can be constructed in mass production and it can be used in many sorts of situations.

The basic idea of it is that it is made out of fiber glass mainly because I think that the objection that people have to concrete shelters

is that the darn things are damp and dirty and collect spiders and they are afraid their kids will get hurt in them and so on.

Fiber-glass is a very nice substance and good to work with. During the last atomic test operation in the Pacific I used a number of instruments that I cannot describe in detail. One convenient way to house the instruments was to put them in fiber-glass boats which were anchored in the lagoon. These boats were subjected to very substantial heats and pressures and they survived remarkably well.

I got to thinking about the strength and resilience of fiber-glass and the chances of reinforcing it to make cheap and light shelters—in California fiber-glass swimming pools are in general use and these are at least half buried in the ground. So I designed this shelter device here—you are looking at practically the first drawing of it. It has not been subjected to rigorous stress analysis but for the moment I think we can say that minor developments would make it able to stand 15 pounds per square inch.

More than that, it has the nice characteristic that it could be tested in the sense that it could be evacuated. You could take the air out of it and atmospheric pressure will exert a pressure of 15 psi on it, so you can tell ahead of time whether it will work or not.

It is equipped with a hand-operated air blower, a very simple jack, and beds enough so that 2 adults and 2 children could sleep in it. It is small but it would be efficient. You could simply make it in a factory and deliver it finished in the front yard; one man could install it—bury it. If you wish I could submit it for your closer inspection.

Mr. RIEHLMAN. Have you made a study of the cost?

Mr. BASCOM. Yes; I have. I thought of it on an airplane going to California and when I got there I contacted a man in the plastic business who thought that they could be produced and sold (with wholesale profit) at a little over $200 apiece.

Mr. BALWAN. Have you presented this to the FCDA?

Mr. BASCOM. I showed them a copy. It was not quite in finished form; but I showed it to them.

Mr. BALWAN. That was not an official transmission on the part of the committee to the FCDA?

Mr. BASCOM. No; it was not. I am talking about an idea that is less than a week old.

Mr. HOLIFIELD. I am glad you are thinking along this line and we will be glad to take your drawing and look it over.

Mr. RIEHLMAN. It sounds very constructive. We may all want to build one.

Mr. BASCOM. I hope you will.

Mr. LIPSCOMB. In your opinion would that sandbag deal work?

Mr. BASCOM. The paper says that it will protect people against radiological fallout—and it will. If you are going to that much effort there are better things you can do to protect yourself against radiological effects.

I doubt if you need some of the features it has. It could be simplified without changing its efficiency.

Mr. LIPSCOMB. Your criticism was of the sandbags and not of the thought. At least they are thinking along the line.

Mr. BASCOM. Yes, I should develop that thought a little bit. The problem is not whether you can think of something that would be protective or not. The problem is whether it can be devised in such

a manner that somebody will build it. FCDA's problem is to think of something that the people of the country might reasonably do to protect themselves. The question is, would *you* build one of these things?

Mr. RIEHLMAN. Wouldn't sand or dirt be suitable? If you get under 3 feet of earth you have one of the finest protections you can have. Wouldn't it be logical to believe that those are the items that we can get hold of more readily than most anything else and they might think of it along that line?

Mr. BASCOM. Sandbags probably would not be so easy to get. You would soon have used up the bag supply in Washington if the people in this room decided to build such shelters. The problem is that the material of the bags rots away if the sand is not dry.

Let me go on to the next subject here. It deals with radiological defense.

The United States does not now have any radiological defense plan. To some extent the people have been warned about the dangers of fallout but they know little about what to do to protect themselves.

For example, the need for persons to take cover after an attack until a survey determines which areas are safe—and the nature of the cover required.

The people must be informed about the nature of radioactivity and of its effects on humans. Means of keeping safe food, water, and air need to be described.

Apparently they need to be described with respect to air anyway for the benefit of the man who sent you the letter this morning. I judge he has investigated it from what he said in the letter.

Mr. HOLIFIELD. That is what he said.

Mr. BASCOM. The problem of how to protect those who evacuate to avoid the initial weapons effects is far from solved.

That is to protect them from fallout.

Little if any information about means of decontamination has been issued. Many measures to protect against radiation must be taken on a national scale since it is easy to visualize fallout from multiple bursts extending across many State lines.

There is a particular need for a national system of reporting the locations of bomb bursts; of monitoring the ground from the air to determine which areas are contaminated; and of passing information about the locations of safe and dangerous areas to the public.

This requires a substantial program of procuring and maintaining instruments and training persons in this operation.

In short, almost everything remains to be done.

Mr. HOLIFIELD. You mean to say that no one in the country is preparing at this time to cope with fallout?

Mr. BASCOM. The Navy, for example, thinks enough of the fallout problem so that as far back as in 1947 originally, but more officially later than that, they set up a group which is now the Naval Radiological Defense Laboratory.

A few months ago they christened a new eight-million-dollar laboratory in San Francisco; it operates on a budget of about $6 million a year for the express purpose of protecting the Navy from radiological effects.

Mr. HOLIFIELD. That is at Mare Island?

Mr. BASCOM. No, at Hunter's Point in San Francisco.

Mr. HOLIFIELD. In the meantime nothing has or is being done to protect the 2 million people in the San Francisco metropolitan area against the same hazard?

Mr. BASCOM. That is not quite right. Some places in the country have done better than others and by coincidence San Fransicso is one of these.

Mr. HOLIFIELD. I see.

Mr. BASCOM. They had as State Director Dr. Al Bellamy who has been interested in radiological problems for many years. For 2 or 3 years the patrol cars and fire engines in San Francisco have carried ion chambers for monitoring. That is a special case. I think there are very few places in the country which have instruments and keep them maintained on that basis.

Neither is it quite correct to say that the FCDA is not doing anything. I am talking about levels of effort. I am saying that the effort ought to be at least in the order of magnitude—a factor of 10—above what is going on now.

Mr. HOLIFIELD. I saw about 3 days ago an announcement in the paper that there was an extension of the Weather Bureau's service in preparing fallout forecasts.

Are you aware of that?

Mr. BASCOM. Yes, sir. I am very much aware of that. It is important to remember that those forecasts are based on assumptions too. They are a very curious bunch of assumptions. First of all they make the assumption that wherever the Rawinsonde balloon rises that would be the point where a bomb would burst (however you can extend the wind patterns it obtains for some distance.) It obtains the velocity of winds up as high as it goes which is up to 60,000 feet and occasionally higher. They have reduced these to a code so that each Rawinsonde station distributes by teletype, once or twice a day, a code message which can be picked up and interpreted by anybody who feels he needs this information and wishes to use it for purposes of radiological defense planning. Unfortunately there is no way that this can take into account where else bombs might burst. Very rapid changes in the weather have repeatedly caused statements from the proving grounds by responsible people, that there was a sudden change in the weather which had caused inexplicable fallout.

The fallout collectors that have been used in the proving ground have almost never caught fallout because they were put out on the basis of weather predictions similar to these and something goes wrong at the last minute.

Mr. HOLIFIELD. In Operation Alert, the fallout predictions proved to be faulty, is that not true?

Mr. BASCOM. There were so many sets of fallout predictions made for Operation Alert, it is not easy to say. There were at least 3 sets made and it is better not to argue about it at the moment.

As to the action that the Weather Bureau has taken—well we might talk a little bit about the history of radiological protection in FCDA. On March 15, 1954, the Japanese fishermen returned home to Japan and the next day it was announced to the world that there was substantial radiological hazard at a distance from the proving grounds. It was eventually decided that they had been about 80 miles

from Bikini Atoll. Nobody, after that moment was in doubt that there would be a substantial hazard over a great area. I was in the proving grounds at that time. When I returned to Washington here in July of that year, I arrived just a couple of days before FCDA was briefed on that point by AFSWP, by coincidence by Dr. Scoville who is one of our committee members. At that time as near as I could tell there had never been any sort of a radiological plan whatsoever or a program of any substance. Immediately a group was formed called the special study group and because I was new and trying to find out what was going on I was made a sort of adviser, perhaps or associate of that group, partly because I had just come back from the proving grounds.

After they had talked for about a month and not seemed to have accomplished much of anything—I presented a specific plan to them of things they should do and one of the items in it had to do with what the Weather Bureau might do, both with statistical means of ascertaining where fallout might go and of day-to-day predictions.

The original letters which passed from FCDA to the Weather Bureau were in substance written by myself and were sent over there officially from FCDA to get that program along.

I don't consider this a promising method because it is based on doubtful assumptions. Although I had something to do with getting it started I am becoming doubtful about how you would use it if you had to right now.

Mr. HOLIFIELD. You do feel that the predictions of wind currents in target areas would be an absolute must and the prediction of wind currents in those areas would be absolutely necessary if you were going to engage in evacuation of any type.

Mr. BASCOM. There again you are back to a set of assumptions which says if a bomb hit in the middle of a city the fallout would most probably land between the northeast and the southeast.

Mr. HOLIFIELD. If you are talking about predictions; yes. If you are talking about a current plotting of wind directions in target areas for the specific purpose of informing the people within that area as to the exact wind velocity and so forth, you are not talking about predictions but practical deterrent warnings.

Mr. BASCOM. I am personally dubious you can use such information. There is a lag in the weather predictions and you are making an assumption that the bomb went off some place. If it went off 50 miles upwind of the city, whatever the wind happened to be, you could not do anything about it. I am doubtful that predictions can be used operationally.

I think it is promising to investigate, but I doubt that it can be used in an emergency. A better thing is to instruct people to get below the surface of the ground and stay there until you find out where the radioactivity is. Then you are not dealing with speculation; you are dealing with actual measurements on the ground. To date, nobody made a very good prediction in advance as to what the level of radiation will be no matter how much data was available. I don't think predictions can be made operationally now (by Civil Defense).

Mr. HOLIFIELD. We will have a witness from the Weather Bureau to give us the story on this.

Mr. BASCOM. Fine. I was asked a few weeks ago by the Weather Bureau to give the weapons effects briefing to the men which they were about to send out to each of the civil defense regional headquarters.

I have been for a long time concerned at the absence of a real program aimed at obtaining an airborne monitoring system in this country. On my own hook I tried to persuade people who knew something about this subject to propose taking specific action to remedy this deficiency.

I interested the General Electric Corp.—a division headed by a man named Ted Rich who built the first airborne monitoring equipment which was used in the Pacific proving ground. Although he has risen higher in the company since then, he maintains an active interest in the subject. I obtained a proposal from him and turned it over to FCDA.

Mr. BALWAN. You mean a statement, an estimate of the feasibility?

Mr. BASCOM. This was a proposal for undertaking a contract to determine what kind of airborne equipment was needed and for making up for instruments and testing them out.

It was for a very small amount of money considering what they said they would do.

Mr. BALWAN. Why would you ask him? Is this part of the work you had?

Mr. BASCOM. Our contract states that one of our jobs is to locate outside independent research organizations who would be willing to do jobs for the FCDA.

Mr. HOLIFIELD. Also you knew that this man had prior experience in the Pacific testing ground?

Mr. BASCOM. Yes, sir. I was trying to find somebody outside the Government willing to accept this responsibility.

I sent this proposal along to Battle Creek, this was in April or May of last year, and I received a sort of a noncommittal answer back saying that they thought they would get to this pretty soon but it did not look like a promising thing to work on at the moment. So I wrote back again.

Mr. HOLIFIELD. To whom?

Mr. BASCOM. Dean Pohlenz, that gentleman sitting there.

Mr. HOLIFIELD. Who is he?

Mr. BASCOM. He is assistant head of the planning staff. He effectively heads the planning staff in Battle Creek and reports to a man named Ralph Spear who is technically the head who stays in Washington. The research division is under his control.

I said:

> I refer you particularly to the testimony of Governor Peterson before the Kefauver committee on February 26 in which he said, "I want to conduct with some urgency research into aerial survey methods."

At the time I wrote this letter 5 months had elapsed and so far as I know no specific program aimed at that has begun yet.

I might say that one of the other things which we have been pushing on very hard in this radiological defense business began about last December, that is, a year and a month ago. It then became evident there was about to be an official announcement made by AEC regarding fallout. This was eventually made on February 15 by

Mr. Strauss. I went to Mr. Peterson unofficially and later officially with a letter from the committee in which we proposed to him that a study of the whole radiological defense program be conducted by an outside organization. Generally Mr. Peterson thought this was a good idea and said, "would you find us a contractor?" This was confirmed in an official exchange of letters between our groups.

We cast about and eventually decided that the Applied Physics Laboratory of the Johns Hopkins University would be one good organization which could do this so we spent a good deal of time in exploratory talks with them.

They were not enthusiastic, but they were willing to undertake this study and negotiations were progressing when it turned out that at the same time another group in FCDA had been dealing with a group in the Public Health Service under the Public Health Service delegation which was also talking about doing the same thing. When it was discovered there were two groups operating in a parallel fashion; this was also at the time of the tests in Nevada; negotiations collapsed completely until about July. By that time the Congress had refused to appropriate additional funds for the Public Health Service, which seemed to be a clear direction to them not to assume any new responsibilities. So that automatically settled it. Then we went back to the Applied Physics Laboratory, but by this time they said they were not interested in undertaking such a project; all this consumed some more time.

So we looked about for another contractor and eventually decided upon the University of California. I talked to many of the deans there to see which of the schools of the university would be most appropriate to do this job. I should point out, in case you don't know that the University of California is a very large organization composed of at least 9 campuses, 2 of which are the Las Alamos Laboratory and the Livermore Laboratory. Besides so much talent is available at the University of California at Los Angeles, the Navy Radiological Defense Laboratory at San Francisco and the nearby Rand Corporation, the University of California it seemed to be an appropriate place to make a study.

Eventually it was determined that a group under Dean M. P. O'Brien, who is dean of the engineering department, would be the appropriate group to make a systems analysis of what needs to be done about radiological defense. Negotiations are now progressing fairly satisfactorily, and I suppose as the contract will be signed any day now—if it has not been already, this will lead to the creation of a radiological defense plan for the country.

This is not to say no progress has been made but in my view it is years too late in beginning.

Mr. LIPSCOMB. Did you mean it was too late or not soon enough?

Mr. BASCOM. I guess I meant it was not soon enough.

Mr. LIPSCOMB. It is not too late for the study.

Mr. BASCOM. No, sir.

Mr. HOLIFIELD. It depends upon——

Mr. BASCOM. There will be a lot of time involved in making this study.

Mr. HOLIFIELD. The point you are making is that the radiological hazard has been known now for some time, since at least the announcement of the Japanese fishermen's contamination, and that a great deal

of time has passed and we as yet have no contract for exploring this field.

Mr. BASCOM. There has been enough time for the Navy to build a laboratory which is substantially equal in size to the whole of FCDA.

Mr. BALWAN. Does the Bureau of Standards have a radiological laboratory?

Mr. BASCOM. Yes, sir. Dr. Lauriston Taylor, of our committee, is head of that group.

Mr. BALWAN. Are they making radiological defense studies?

Mr. BASCOM. At the moment I believe the Bureau of Standards is doing quite a number of things. I can't testify about those.

Mr. BALWAN. Mr. Chairman, I want to dwell upon that thing. In terms of calling that group up here, I wanted a quick "yes" or "no" whether they are doing anything in this area.

Mr. BASCOM. There are several groups; one is working on a fallout computer which looks very promising. It has a presentation not unlike a TV screen. By turning dials you can simulate winds and radiation levels and bomb sizes. What you get is a fallout pattern on a cathode-ray scope.

Mr. BALWAN. That was recently in the press.

Mr. BASCOM. It may have been. I didn't see it. Another group in a way is also under Dr. Taylor; it deals with establishing levels of radiation under which it is presumed people can work in emergency conditions.

Mr. BALWAN. The Nation is doing something. Are they under a delegation?

Mr. BASCOM. Yes, in a way they are. They are under the Commerce Department and I am not quite sure how the delegation reads on that point. I don't mean to say we are not doing anything but it is so much smaller than is required and so spread around. Many other places are working on this beside these two groups.

Mrs. GRIFFITHS. The Navy is spending more to protect the Navy than FCDA is spending to protect the Nation.

Mr. BASCOM. By quite a bit.

Mr. RIEHLMAN. Do you have sufficient funds to carry on this program that you are suggesting?

Mr. BASCOM. The one at the University of California.

Mr. RIEHLMAN. Yes.

Mr. BASCOM. Yes. That is a study aimed at producing a specific plan for the country. There are ample funds to do the study. When the study is finished it will cost some money then because they will presumably recommend expensive things to do, like a national monitoring system.

Mr. BALWAN. That study at California will not wind up with hardware and a system?

Mr. BASCOM. No, sir; that ends up with a proposed plan for the country; then somebody has to implement that plan. In general it will include the kind of things you say to the people, what kinds of cover and shelter you recommend, what you tell people about the difficulties of ingesting air and water and food and principally the framework of a system for monitoring radioactivity.

In other words, after bombs go off, how do you tell where the radioactive stuff really went and how do you tell the people about the danger

after you know? Then comes decontamination, which means removal of the radioactive particles later on.

Mr. RIEHLMAN. In your own study on atomic energy and having all the experience you have had with it, would it not be possible from all of these sources, from the Atomic Energy Commission and the Navy and other places, information that would be sufficient rather than setting up another study group with respect to this type of a program?

Mr. HOLIFIELD. You directed the question to me. My answer to that would be all of these studies would be valuable. The studies outside of the recent tests in Nevada which did have a definite purpose of civilian defense solutions, the other studies were for specific purposes, such as the Navy or certain types of installations, certain areas, certain hazards.

The hazards are different where there is water contamination such as a harbor would have, and air contamination which would be dispersed more readily and I am not sure that a coordination of the information for specific purposes would not be necessary and also to explore the areas which none of these specific studies have covered.

Mr. RIEHLMAN. Wouldn't that necessitate additional experimental work in the field of the explosion of nuclear weapons?

Mr. HOLIFIELD. It does.

Mr. RIEHLMAN. To gather that type of information.

Mr. HOLIFIELD. It does.

The field is not by any means completely covered as the witness knows.

The forthcoming tests in the South Pacific will have as one of their important parts, certainly important to the civilian population, a great number of tests which will bear on this very subject.

Mr. RIEHLMAN. Then we would have no other information other than we have gathered through these tests.

Mr. HOLIFIELD. I think that is probably true.

Laboratory tests would be important as well as the actual physical tests.

Mr. BASCOM. In the planning that I was talking about, the problem is not to get more data. I think there is as much data as can reasonably be obtained but it is spread around. The problem is to bring it together and make a system out of it.

Mr. RIEHLMAN. Your idea is to coordinate the data.

Mr. BASCOM. This group is not an experimental group, it is a planning group. Its job is to bring together the information that is already available.

There is no special experience in radiological problems within this particular group. Their intention is to bring together all the people that know the score and to utilize their present knowledge to make a plan for the country.

Mr. HOLIFIELD. The explosion of 1954 in the islands gave to us a tremendous amount of information on radioactive fallout which we did not have before. We had the practical experience of having to evacuate the natives from the Rongelap Islands and also the weathermen who had been stationed on a number of these different islands. These areas became contaminated and we had instruments measuring radiation not only on the sea but also on the islands. Certain things were found out there as was brought out in Dr. Libby's testimony.

It was noticed there that the very cheap sheet-iron buildings that housed the Naval personnel, and other personnel, gave a great deal more protection to them than people and the natives who were outdoors in the same area. This was one of the findings and this was undoubtedly what influenced some of your testimony today in the way of shelter.

Proceed.

Did you have a question, Mr. Lipscomb?

Mr. LIPSCOMB. It was answered, because Dr. Libby in his testimony said there had been extensive research down in the field of radiation.

Mr. HOLIFIELD. I might say that my statement still stands that there is some additional testing going to be made in the spring of this year to fill in gaps in that area.

Mr. BASCOM. Of course various groups from the University of California will be there.

Mr. HOLIFIELD. That's right. They will be there doing the work.

Mr. BALWAN. The point you are making is that this has never been brought together?

Mr. BASCOM. That is correct. Now I will deal with evacuation.

The use of evacuation as a technique has been almost universally misunderstood. Its basis is in the thought that it is best to have as much distance between the person and the explosion as possible—and it is hard to disagree with that. In addition, it reduces the concentration of people so that a single bomb would not kill a great number.

Unfortunately evacuation is based on one set of assumptions—namely that a bomber will hit the center of the city with a large weapon. For smaller weapons carried by missiles, striking with probably large inaccuracies and allowing short warning time, evacuation does not seem to be a sensible procedure.

So the real question is whether evacuation is sensible, not whether it is possible.

I believe that evacuation is the best measure for unusually attractive target areas which are more than 300 miles from the coast, under the present conditions of warning, until the advent of the ICBM. All those without satisfactory shelters should leave and they should go more than 30 miles from the target area before stopping. To say that evacuation is a policy (as FCDA has done) without stating these limiting conditions is meaningless.

Evacuation exercises almost invariably work better than expected and for many places there is no question but what evacuation is feasible if warning time of not less than 1 hour were available.

(Unfortunately no one will ever know how much warning time there is.) This does not necessarily mean evacuation is the best procedure.

In my view it is an interim measure suitable for certain areas largely because other more durable and useful measures have not been taken. During the period in which evacuation is the defensive plan, shelters and other defenses should be built for the day when evacuation will not be possible.

Mr. HOLIFIELD. Do you believe that the reasoning behind evacuation is understood by the people?

Mr. BASCOM. I don't think so. I was in California a little over a week ago and I see that Oceanside, Calif., is planning an evacuation. In my view there are few better places to be in the case of attack. It is a small city and an unlikely target. This is true of many places in

the country. Evacuation is one means of defense but its use has been largely decided on emotional grounds rather than technical grounds.

Mr. HOLIFIELD. Isn't this the place, such as in a small city of Oceanside, rather than engage in a struggle of futility, for the Federal Government to give some sensible advice as to the particular need of these cities which are well without the target area or not susceptible to blast and thermal effects at least. That their protective measures should be more or less recommended by the Federal Government as to what would be the best for them under the circumstances?

Mr. BASCOM. That is generally what I believe. It isn't that I think evacuation would be a foolish thing, exactly, for them to do. I believe they probably could do it if they wanted to. The question is whether it is the best thing for them to do. It might be better for them to do a lot of other things like preparing for people who might come from Los Angeles.

Mr. HOLIFIELD. Or from San Diego.

Mr. BASCOM. Mobile, Ala., has practiced evacuation many times and has done it well. This doesn't influence me in my feeling that this may not be the best procedure for them to follow. Under the specifications I have outlined here I think evacuation is one good defense plan. But, if we don't start now getting ready for what we will do when the ICBM gets here in perhaps 5 years, we will not have anything to protect us at that time.

Mr. HOLIFIELD. This is true, that the adequacy of an evacuation of a concentrated area like Los Angeles with 5½ million people in the metropolitan area and, I believe, four main roads leading out and into the desert, that evacuation of a city of that type is almost—well, it is completely unrealistic. It just could not occur.

Mr. BASCOM. Well, I would rather not debate on that point. I would rather say that Los Angeles is a very logical target for a submarine attack. It is in a bowl in the flatland between the hills and the ocean and it would be hard to miss. Considering the fact that a submarine attack is likely, there would not be enough warning to evacuate anyway and they better prepare to do something they can do. This is not to say you can or cannot evacuate.

Mr. HOLIFIELD. Having had the experience of trying to get home from Rose Bowl games in Pasadena to my home city of Montebello 10 miles away on New Year's Day and spending something like 3 or 4 hours getting home, I should shudder to think of filling the two highways that run north and south and out into the desert through a pass in the mountains with 5½ million people trying to get out.

Mr. BASCOM. I repeat; where evacuation has been tried it has worked better than anyone has expected. It is a sort of a game played by a very special set of rules in which drivers no longer worry about a slightly bent fender or red lights. There is free flow in the traffic arteries, and by the way, if you double the width by using the left-hand lanes going in the same direction you have twice the normal flow.

I have written up a number of exercises which seem to be very encouraging. One is a study of Portland, Oreg.'s evacuation exercise called Operation Greenlight. I submit this for your reading if you wish. (See appendix, exhibit 4, p. 272.)

Mr BASCOM. They show that Portland, Oreg. could, practically on its own, decide what seemed to be the best thing to do and follow completely through on a plan.

They have done all kinds of things out there which Washington, D. C. has not done. For example: They have built a real command center. They have arranged the traffic lights in such a fashion that when their warning system sounds, all the traffic lights become set in the evacuation pattern. Portland is a city of one-way streets so there is nothing a driver can do except follow the traffic out of town. So I do not say that evacuation is not feasible; however, then we must review our assumptions and see whether it is a good thing to do.

Mr. HOLIFIELD. And also to recognize that the study of evacuation must rest upon the area involved, the hazards that might be involved, the type of ingress and egress roads and bridges and so forth.

Each area would have to receive a special study in relation to other means of protection.

Mr. BASCOM. That is generally correct. There should be a set of planning assumptions which is sensible for many areas so that each area does not make its own assumptions and then make a study based on the ones it selects.

Mr. HOLIFIELD. That is true. But in your opinion would it be necessary for the Federal Government to take the responsibility for the planning, the master planning of a target area rather than to leave it up to various subdivisions to exercise their own judgment?

Mr. BASCOM. I don't think the Federal Government can do everything for everybody but I think they could exercise a much stronger control over the planning than heretofore.

Mr. HOLIFIELD. Well, specifically let me ask you because I think this is an important point: Do you believe that if a free choice of planning for types of defense is left in the hands of each community, you can have an efficient target area plan of nonmilitary defense?

Mr. BASCOM. No, I really don't think you can.

Mr. HOLIFIELD. In other words, there must be Federal coordination and supervision and advice with, full participation of the local bodies in order to arrive at what seems to be a sensible plan, because in many instances the Federal Government alone has the information which is necessary, some of it classified, to bring to bear upon the evacuation of a target area?

Mr. BASCOM. Yes, sir, I agree with that.

Mr. LIPSCOMB. I am sorry I did not follow that too closely. You said that the communities that have better planning given to them from Washington, D. C.?

Mr. BASCOM. I said planning assumptions.

Mr. LIPSCOMB. And then we discussed this a little while back.

Suppose we do have all these planning assumptions made, do you say now under the present law that the local, State, and county governments have to conform to what the civilian-defense organizations tell them?

Mr. BASCOM. Under the present law they obviously don't have to conform. You don't really make people do anything. You say, "We have very carefully considered what the probabilities are and our advice to you is that because you are in such a location you should do this—" whatever it happens to be.

Mr. LIPSCOMB. You mentioned that the city of Portland has, in your opinion, a good evacuation procedure.

Mr. BASCOM. Yes, sir.

Mr. LIPSCOMB. How did those good procedures come about?

Mr. BASCOM. I think mostly they became so irritated with the Federal Civil Defense Administration they practically refused to talk to them and went ahead on their own.

Mr. LIPSCOMB. What could the Federal Civil Defense agency have done to make Portland do it? Weren't they supposed to do it on their own?

Mr. BASCOM. That is correct. We must judge this on whether it has been done, not whether it has been good or not. Portland, for example, right now does have a good evacuation plan. The question is whether evacuation is the best plan for them, not whether they worked it out and are able to do it. What about the era of the intercontinental ballistics missile which may come in 5 years, where you have a large spread of ground zero, where you don't know whether you are better off if you get out of town or stay at home. I would not recommend that Portland should keep their evacuation plan for those years.

The Government should tell them, "In 5 years you will face this threat; you better get ready."

Mr. LIPSCOMB. Don't you believe the Federal agency is looking into this problem?

Mr. BASCOM. I suppose they are. It is a question of effort level.

Mr. LIPSCOMB. Don't you recognize that some of the civilian defense programing that has been put into effect over the past 5 years has been worth while?

Mr. BASCOM. Yes.

Mr. LIPSCOMB. And so all we have to do is change the program from year to year to conform with new weapons and new methods of warfare and other things that are factors in this.

Mr. BASCOM. That is the part I don't agree with.

I think you should not change it from year to year. I think you should have a basic long-range program. You can't ever overtake the problem if you keep trying to catch up with it year by year. You have a chance to converge at a point in the future. There is some chance of having a civil defense eventually if we decide approximately what our problem will eventually be and try to head in that general direction.

Suppose we go on a year-to-year basis and all of a sudden we get to some year, say 1961, then they say, "Next year we will face the ICBM". What do you do in one year to get ready for the ICBM?

Mr. LIPSCOMB. At the present time according to your statements we can expect the ICBM within 5 years and you can say we can plan 5 years ahead but 10 years ago or more in 1951 could you have planned a civilian defense program for the intercontinental ballistic missile?

Mr. BASCOM. Ten years ago we probably could not have.

Mr. LIPSCOMB. You have to plan for your civilian defense with what you know as a war potentiality at that time.

Mr. BASCOM. That is not quite correct. You can see what the trends are and extrapolate; that is the way planning is done. There was a piece in the paper this morning that said in twenty years there will be 4 million people in Washington. It is a part of planning any long-range program; it is not peculiar to civil defense.

Mr. LIPSCOMB. When civilian defense went in we certainly didn't have—maybe people did but I did not have—any idea of the magnitude

of the hydrogen bomb when we started civilian defense. We were planning for blockbusters and other things.

Mr. BASCOM. Yes.

Mr. LIPSCOMB. In 1952 or 1953 we started to prepare for some other kinds of a bomb. In 1955 we start preparing for the intercontinental ballistic missile.

Mr. BASCOM. When FCDA was started the A-bomb had long since been the dominant factor and there was no use to prepare for blockbusters.

Mr. LIPSCOMB. In your judgment, in your statement you are thinking 5 years ahead what we should be doing today for 5 years ahead?

Mr. BASCOM. That is absolutely correct.

Mr. LIPSCOMB. I appreciate having your opinions of what is 5 years ahead. But I don't see how you can criticize what has been done the past 11 or 12 years.

Mr. HOLIFIELD. I differ completely. I think we look to the mistakes of the past. I am quite willing to say because I participated in it that the passing of the 1950 civil-defense legislation was a futile gesture at the time.

It was obsolete in view of the fact that in 1945 we had exploded the atomic bomb and in 1950 the legislation which Congress passed was at that time in my opinion ineffective. It is much more obsolete and dangerous today because in the meantime in 1952 we exploded the hydrogen device which makes even the atomic bomb out of joint with our 1950 legislation.

Mr. LIPSCOMB. Mr. Chairman, what I may be objecting to—and I believe I have expressed myself before that I am not completely satisfied with civilian defense as now set up.

Mr. HOLIFIELD. Yes.

Mr. LIPSCOMB. The testimony seems to give me the impression that he claims nothing has been done in the field of civil defense by our Federal Government, nothing that has been done is worth while.

Mr. HOLIFIELD. I think that is unfair to the witness if I may say. He has admitted that many things they have done have been good.

Mr. LIPSCOMB. I wish he would point it out myself. I didn't get that impression.

Mr. HOLIFIELD. He is here to tell this committee what he thinks ought to be done in the future. And to point out the mistakes that he thinks are being made here in the past.

He is not here to pat anybody on the back.

Mr. LIPSCOMB. Nobody is asking him. He ought to point out what has been done in the past. Some of it has been worth while.

Mr. FASCELL. That may be debatable, Mr. Lipscomb. I don't know yet.

Mr. LIPSCOMB. I will get to that.

Mr. HOLIFIELD. I don't know either. Personally I think some of the things that have been done have been good. I have been a critic of what Congress has done and what the civil defense has done ever since it has been established, ever since the law was passed. That is my personal opinion. My criticism of Congress is that they have not fased up to the realities of the situation.

Mr. LIPSCOMB. For instance, Mr. Chairman, he has answered your question and says he agrees with the Project East River report.

Mr. HOLIFIELD. I might say that the first report was given in 1952 and this 1955 review subscribes to the recommendations made in 1952, many of which are not being implemented.

Mr. LIPSCOMB. And then in his statement—I am trying to straighten out so I can evaluate what he says, he says in his statement that $16 million of the taxpayers' money has been wasted on a warning system.

Mr. BASCOM. No, I was trying to compare, in terms of amount of money, what has been spent on the warning system. I said billions had been spent on the military warning system and only 16 million had been spent to pass it along to the taxpayers.

Mr. LIPSCOMB. To relay this warning to the poor taxpayers who just paid for it, all civil defense organizations together have spent a total of 16 millions.

Mr. BASCOM. Yes.

Mr. LIPSCOMB. That is not sufficient you say?

Mr. BASCOM. That's right. It is a fraction of 1 percent of the military effort.

Mr. LIPSCOMB. The East River report says:

FCDA in spite of many difficulties has also progressed notably in the area of warning and communication in stockpiling of medical supplies and arranging such test exercises as Operation Alert.

Taking great reliance in this report on Project East River, I do not think this report conforms in some ways to the testimony you are giving.

Mr. BASCOM. Perhaps I should not have said I subscribe *entirely* to that report because I don't subscribe to the things you have just said.

Maybe gains have been made but the question is whether we have what we need. I am disappointed if you think that I have been here backbiting and stating my opinions in a malicious way. I am trying to state the truth of the situation without pointing a finger.

Mr. LIPSCOMB. I don't mind you being pessimistic and proposing to plan 5 years ahead. I think we should. I think that is one of the things our committee is concerned with too. But I don't think that there is any place in here for criticizing completely the efforts that have been made in the field of civil defense.

Mr. BASCOM. I am sorry if it looks like I completely criticized them. It is wonderful that $16 million was spent on warning devices. It is perhaps a tenth of the sum that should have been spent.

Mr. LIPSCOMB. That is not all the fault of the FCDA either.

Mr. BASCOMB. The first item of this statement criticized the Congress, if you will notice, for not having participated in the exercises. I think a good many parts of the Government are to blame for the situation as it now stands.

Mr. HOLIFIELD. It appears to me that his testimony has been very frank in condemning the Congress, and I am willing to accept my part of the condemnation for not taking up this matter sooner.

That is one of the reasons why this subcommittee was prodded into this, because we realized that here was a field that needed study. I want to disassociate myself right at this moment from any attack on FCDA as such.

I think I realize, and I have said not once but I have said publicly time and again, they do not have a law that gives them enough authority to do the job which modern technology has forced upon them.

But notwithstanding that fact, we certainly can recognize that money has been wasted in civil defense by previous administrations, in my opinion, and this administration.

I am convinced of that. Many of the things that have been advocated, such as evacuation for Los Angeles, are completely unrealistic. My colleagues here will agree with me. I think this is the time to do the planning. The lack of local civil defense planning is completely unrealistic. So I think that the witness has certainly struck about on all sides and hit Congress as hard as he has hit FCDA.

I don't resent it. We want his testimony. I also call to the attention of my colleague that in the East River report it says "If there has been a net reduction in urban vulnerability it has been very small." That is not to say that there has not been any, but there hasn't been enough.

Mr. LIPSCOMB. That is under the Department of Defense mobilization or some other department.

Mr. HOLIFIELD. Urban vulnerability can come not only from dispersal but lack of proper shelter and lack of proper evacuation, if that is feasible, or can come from any other factor.

Mr. LIPSCOMB. I just think, Mr. Chairman, that we need, in this committee, good solid suggestions on how we can improve civilian defense in our Nation and properly inform the people, and also give reasons how we can do it. That is what we are seeking answers on, how we can get this job done.

Mr. HOLIFIELD. We are also seeking to know what is wrong with the present situation regardless of who is to blame and this gentleman is telling us what is wrong and he is also making some suggestions.

That does not mean that the committee will take them. My only thought is that I think the witness has certainly been frank enough and he is putting out his ideas as to what he thinks is of benefit to the committee, and maybe they are not.

We will have to decide that when we write the report.

Mr. RIEHLMAN. Mr. Chairman, I want to concur with your statement with respect to the committee's alertness to this problem because both of us introduced legislation 2 years ago to cope with it, but I do think that we can take into consideration the criticism that the witness is giving us this morning. We are certainly going to have an opportunity for Federal Civil Defense to present their side of the case and clearly give us a picture of what has been done.

Mr. HOLIFIELD. Yes, sir, I talked to Mr. Peterson yesterday over the phone and I told him that Federal Civil Defense Administration would be given all the time to present their program, to tell us what has been done, to tell us what they need in the way of legislation, additional appropriations or anything this committee could do to be helpful to them.

I assured him of that and I assured the committee that course would be followed.

Mr. RIEHLMAN. I concur with my colleague from California, and I want to say that the committee is definitely interested in constructive criticism, even if it is not constructive. We want to get the criticism. Then we want to deduct from the witness the constructive side he has to offer in correcting the problems that he sees and recognizes with respect to the weakness of our program. I would want the witness to know that any questions that I have asked him have been purely on

the basis of trying to get from him when he has made a criticism an answer to his criticism so we as a committee will have something to judge his criticism on and can do something constructive about it. I think that is the position our committee always wants to take and will.

Mr. HOLIFIELD. I agree with my colleague and I think that if you will take the different subheads, for instance, the one on radiological defense, he says:

> The United States does not now have any radiological defense plan.

That is his opinion. I happen to agree with him. I would say we do not have an effective radiological defense plan. I think the Nation as a whole does not have any coordinated plan. Then in the third from the latest sentence or indentation, he says:

> There is particular need for a national system of reporting the locations of bomb bursts; of monitoring the ground from the air to determine which areas are contaminated; and of passing information about the locations of safe and dangerous areas to the public.
>
> This requires a substantial program of procuring and maintaining instruments and training persons in their operation.

It seems to me in each one of these subdivisions where he has criticized he has made what he thinks are constructive suggestions. It is up to the committee to evaluate them.

Would you go ahead, Mr. Fascell?

Mr. FASCELL. Before we leave that topic matter, I am still worried about Oceanside.

Mr. HOLIFIELD. Thank you. I will worry about some of your cities in Florida.

Mr. FASCELL. You have testified that evacuation as a policy, that is a national policy, is not a good measure, and at best it is an interim device and in cases for example like Oceanside, it is a completely useless proposition and is not an efficient use of effort. Am I interpolating your testimony?

Mr. BASCOM. That is approximately correct; yes.

Mr. FASCELL. Using Oceanside again as an example, what possible harm can it be in alerting the citizens to all of this problem by giving them something tangible, which is evacuation. They may not be a primary target but they might get a burst.

Mr. BASCOM. It seems to me the danger in this is that by using the assumption that the city would be hit, everybody should leave it. For that assumption, evacuation may be a reasonable thing to do, but against almost every other form of attack—which are always possible and which are also postulated in the FCDA assumptions—the problem of taking care of people under adverse conditions, of keeping them fed and housed, the problem of keeping them informed against psychological warfare, the problem of keeping them safe against biological and chemical warfare, they are much better off at home.

If you train them to evacuate and this is not a good thing to do, they are more susceptible to these other dangers.

Mr. FASCELL. You mean in their own home?

Mr. BASCOM. In their own home with their family.

Mr. FASCELL. You are not talking about one of these median shelter jobs?

Mr. BASCOM. There should be one with each home.

Mr. FASCELL. We are not talking about that. We are talking about a plain house.

I don't want to choose between a house and a shelter because all I have as to that is a house.

Mr. BASCOM. In these other cases you are better off in a house than to leave it and go out in Pendleton Hills.

Mr. FASCELL. You are saying as an overall policy evacuation is no good?

Mr. BASCOM. That is not what I said. I carefully specified a situation under which evacuation is good.

Mr. FASCELL. That would be in specific cases.

Mr. BASCOM. That is right.

Mr. FASCELL. So overall it is not good. It applies only to a specific case.

Mr. BASCOM. For quite a few specific cases. I don't think it is entirely bad. It is one defensive mechanism and we better think twice before we try to use it.

Mr. FASCELL. I wouldn't argue that outside of 200 specific areas we want to use it.

Mr. HOLIFIELD. We are faced with a practical consideration right now that some of the members have luncheon engagements. I suggest with the committee's acquiescence that we accept the balance of Mr. Bascom's statement at this time for the record, that we also allow Dr. Tuve to come forward to present his statement for the record at this time because the staff has released both statements to the press.

Dr. Tuve, will you please do that. Present your statement to the committee officially for the record.

Dr. TUVE. All right.

Mr. HOLIFIELD. Dr. Tuve's statement in its entirety is accepted for the record.

Dr. TUVE. I was going to read two paragraphs out of my letter.

Mr. HOLIFIELD. We will have you back for the reading of the report and then you can read the letter. We did not release your letter to the press.

Mr. TUVE. I was going to read only 1 or 2 paragraphs.

Mr. HOLIFIELD. If you want to do that, that is perfectly all right.

Dr. TUVE. It is not important to me at the moment.

Mr. HOLIFIELD. Dr. Tuve, you may have misunderstood me. We are going to reconvene later and go through in the regular manner. We are doing this because your statement has already been released to the press.

Dr. TUVE. O. K.

Mr. HOLIFIELD. And to keep up our relations with the press we have to protect them.

(Discussion off the record.)

Mr. HOLIFIELD. We will try to come back at 2 o'clock, subject to adjournment for roll calls and then reassemble here. The committee will request the witnesses if it is possible to reassemble here at 2 o'clock.

The committee will stand adjourned then until 2 o'clock.

(Whereupon at 12:35 p. m. a recess was taken to reconvene at 2 o'clock of the same day.)

AFTERNOON SESSION

The subcommittee reconvened at 2 p. m.

Mr. HOLIFIELD. The subcommittee will be in order. Mr. Bascom, I believe we have come to a part of your testimony entitled "Conelrad," have we not?

Mr. BASCOM. Yes.

Mr. HOLIFIELD. You may proceed then at this time.

FURTHER STATEMENT OF WILLARD BASCOM, TECHNICAL DIRECTOR, ADVISORY COMMITTEE ON CIVIL DEFENSE, NATIONAL ACADEMY OF SCIENCES

Mr. BASCOM. Probably a majority of Americans will never be really well informed about what to do in a civil-defense emergency. Because of its remoteness from everyday life they will forget or be uncertain about what to do when the warning sounds. However, at the instant they realize an attack is imminent the willingness of the people to learn will rise remarkably and civil defense will have its most attentive audience. The obvious way to inform them is by radio, but the present conelrad system is such that normal broadcasting stations are required by law to go off the air before radios can be turned on and information passed.

At or before the sounding of the public alert signal all normal radio stations go dead and start changing to the 640–1240 conelrad frequencies. Since the process of getting conelrad ready takes 15 to 30 minutes, there is no source of information at all during the critical minutes after the warning sounds.

Mr. BALWAN. May I interrupt at this point?

Conelrad may not be clear to some people as to how it actually works. Mr. Bascom has given me an explanation of it that it might be worth while to have in the record.

Mr. HOLIFIELD. Yes. Give us an explanation of it.

Mr. BASCOM. Conelrad stands for the control of electromagnetic radiations, principally meaning the commercial radio and television wave lengths.

As it works, the first message that comes out of the Air-Defense-Control Centers of the Air Force is a radio alert. This goes to radio stations which are called key stations in each of certain target areas. When these key stations receive the signal, they kill their carrier wave for a moment and go back on for 15 seconds, and then they kill it again, and then they come up and sound a 1,000-cycle note for 20 seconds. After this they make a short announcement, usually consisting of two sentences, "This is a civil-defense emergency. Tune your radios to conelrad." Then they go off the air.

Mr. HOLIFIELD. Is that made to the public?

Mr. BASCOM. To whoever is listening to the radio station. If you are listening to that station you get that much of a warning. All other radio stations are required by law to have to monitor one key station. They have mechanisms, devices which pick up the break of the frequency and the 1,000-cycle note. That automatically sounds a warning in the other radio stations, and when they hear it, they make the same announcement and go off the air. Then they have to change

their crystals, to tune themselves to one of the conelrad frequencies. Not all stations do this. In the Washington area there are 2 clusters of 3 stations each. One operates on 640 kilocycles and one on 1240 kilocycles.

None of these stations are on that frequency to start with. They have to adjust to get on the new frequency and have to be synchronized with each other.

Then, through a systematic rotational device the signal is broadcast first by 1 station in the 3-station cluster, then by another, then by another, and it skips back and forth at odd intervals, 6 seconds, 12 seconds, 2 seconds, so there is no one place which is sending out the signal.

Mr. BALWAN. What is the basic purpose for getting different places to send the signals?

Mr. BASCOM. The idea on which conelrad is based is that it will prevent enemy bombers from navigating on a radio station and homing on your city. That is the reason conelrad exists. Besides going to the different frequencies, stations go to a much lower power level. The result is that you are really tuned to more than one station at low power. If you are off to one side of the city, you may hear the one nearest to you very loudly, and the one further away hardly at all. So you have a high signal for a moment, then a weak signal, and then back up again. It is an intermittent sort of a signal. The voice that goes over the airways originates in the civil defense headquarters, so it also depends on your having someone there to say something, and somebody to operate the radio station; in other words people to keep the whole thing working.

Is that enough of an explanation?

Mr. HOLIFIELD. Unless there are some questions.

Mr. BASCOM. Let me finish this please.

When conelrad does go on the air, its signals are quite likely to be unsatisfactory because of the low power output and the sequential nature of its operation. In Washington, D. C., for example, there is no prepared script and there may not be anyone present who can give sensible directions to the public.

Mr. HOLIFIELD. Will you elaborate on that?

Mr. BASCOM. Yes. May I get to the end?

Since no provisions have been made for sheltering either the people who will operate the radio stations or the announcer in the civil defense headquarters, the people required for the operation of conelrad must therefore be regarded as expendable.

A most obvious objection to conelrad is that it is based on different assumptions from other civil defense measures. If there is time to evacuate (FCDA claims there is—1 to 3 hours) this means that enemy aircraft are much too far away to conceivably get any navigational use out of our ordinary radio stations. Why shouldn't the first half hour or so be used to pass information to the public? This is after the alert signal.

Our committee has recommended that FCDA reexamine the entire question of communications in an emergency and arm itself with data, rational arguments, and an alternative plan which could be put before the National Security Council.

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To answer your question, we have made a detailed study of the warning system and conelrad in the Washington, D. C., area. The things I have said are substantiated in some detail.

Would you like me to go into a specific part of it?

Mr. HOLIFIELD. No; I would like to know what you mean by saying there may not be anyone present who can give sensible directions to the public.

Mr. BASCOM. In Washington, D. C., there is an old wooden schoolbuilding located on Howard Street up on Wisconsin Avenue, 4 miles from here. It is manned by a dispatcher on a 24-hour basis, who sits there and operates the radio and takes care of incoming calls and information and so forth. During the daytime there are a few additional people around there.

If a signal comes in at night, this man is alone. He is not a highly skilled person. He is barely able to operate the equipment in front of him. There is no script left for him, few instructions for him as to what he should say and do in an emergency.

This has been documented. This report has not been widely distributed, but it has been sent to the Members of the House and Senate District Committees and the Commissioners of the District of Columbia and the local authorities immediately concerned with this. No publicity has been given to this and we were careful not to draw any conclusions. We have said, "Having gone to the trouble of making a study, we think you should at least know this is the situation," so it begins with a section called "Attention," simply calling your attention to conditions as they now exist in Washington, D. C.

Mr. BALWAN. Was that finding publicized, at some time in Washington, D. C.? There was one man and there was no script.

Mr. BASCOM. The station is always manned, but a simple dispatcher doesn't know what to say to the public. There is doubt as to whether anyone does.

Mr. BALWAN. That is a finding in the report?

Mr. BASCOM. Yes.

Mrs. GRIFFITHS. You mean he might say, "We are under attack. We are off the air," so it could create more panic?

Mr. BASCOM. You don't know what he will say. It would be something extemporaneous conceived at the last minute, presumably.

Mr. HOLIFIELD. That is in the Washington local civil defense warning area.

Mr. BASCOM. Yes, sir.

Mr. HOLIFIELD. Center, rather.

Mr. BASCOM. Yes.

Mr. HOLIFIELD. Do they have any connection directly with the FCDA, central headquarters outside the city?

Mr. BASCOM. I don't think so. The warning system is very flexible, and I finally was able to diagram it for them. It was really the first time I think anybody had understood how the warning system here worked; I made complex diagrams to show the flow of information through the warning system.

I don't think there is any connection to FCDA. They get their basic information about an alert from the air defense control center in Newburgh, N. Y.

Mr. HOLIFIELD. Then it is their obligation to relay it throughout the country.

Mr. BASCOM. No. It comes from the Air Defense Control Center first to the radio key station and then, or shortly thereafter, to the civil defense headquarters in Washington, D. C. This is only a local headquarters.

Mr. HOLIFIELD. Then your real flow of a warning is from the military direct to radio stations and not necessarily to the FCDA and then to radio stations?

Mr. BASCOM. That is right.

Mr. HOLIFIELD. Are they notified simultaneously?

Mr. BASCOM. There is a little bit of ambiguity about the radio warning. There is apparently more than one way it can be handled; however, it is generally felt that the radio alert would be sent out at the same time as the yellow alert.

Mr. HOLIFIELD. When that warning comes to the military center from, let us say, the DEW line or any other outlying warning line, your previous testimony indicated that there were one or more men from the civil defense at those centers.

Mr. BASCOM. Yes.

Mr. HOLIFIELD. If they are, what is their function?

Mr. BASCOM. I have never actually been in one of the centers, but I judge as soon as the commanding officer makes a decision that this definitely is an attack or a likely attack, I suppose this man pushes the button and distributes this to the local key points where the warning is further distributed.

Mr. HOLIFIELD. If he is not there, then it would be up to the military to convey that to the civilian defense people.

Mr. BASCOM. That is correct, in many cases. There is generally a technical sergeant or someone like that there.

Mr. HOLIFIELD. All right.

Mr. BASCOM. The next item.

Mr. HOLIFIELD. What has been their response to your recommendation to use their first half hour for regular radio announcements?

Mr. BASCOM. It seems to me that is made as a sort of a suggestion. What we have said is that this is a matter which probably has to be argued out before the Security Council, since this regulation was put in at the beginning at the behest of the Air Force. I think if there were an alternate plan which was carefully thought out, so this could be debated before the Security Council, I think there would be high probability that the Civil Defense people could win and retain the right to use their radio stations. I think that is absolutely essential.

Mr. HOLIFIELD. If every radio station in the country could immediately break its commercial program or entertainment program and start right in with a prepared script under certain circumstances, there would be a wider coverage, would there not?

Mr. BASCOM. This is one time when the people really want the information, no matter what they ever thought of civil defense before.

Mr. BALWAN. There is a military requirement superimposed upon the civil defense requirement.

Mr. BASCOM. That is correct.

Mr. BALWAN. The military department says, "Your local stations have to go off the air before foreign planes will home on them."

Mr. BASCOM. That is right.

Mr. BALWAN. Then we have to make the best of the situation, we have to try not to give them as good a target, yet keep some communication with the public.

Mr. BASCOM. That is what it is intended to amount to, but if you talk to the Air Force in a different context, and say to them, "How would you home on Russian radio stations?"it has almost never occurred to them that they might do this.

Then you say, "Couldn't the enemy find these cities just as well without radio stations," and they are quite sure the enemy could.

This takes a good deal of the emphasis out of their original arguments. If our enemies can find the cities any way, maybe we are doing ourselves more damage by not using the stations than if we used them.

Mr. HOLIFIELD. This is a matter you recommend for study and evaluation rather than making a specific recommendation.

Mr. BASCOM. I think the need for this is perfectly clear within FCDA. There have been internal reports written. I don't think FCDA is at all satisfied with the situation with respect to Conelrad. We have suggested that they do something about it. They have said the Air Force is more powerful, and they cannot do anything about it.

Almost all of the present effort is going into the protection of "target areas" against initial weapons effects. The survival of the United States as a country is more likely to depend on the ability of the areas which are not directly attacked to carry on with several times the normal workload.

These areas will need to be able to support great numbers of refugees; to decontaminate themselves; to produce the necessities of life—all at once. Few target cities have an alternate plan for use if they are not attacked—certainly life will not return to normal. There will be substantial social and economic disruption. Many cities will be swamped by survivors from nearby bombed-out areas. The era of missiles, which may strike almost indiscriminately, will undoubtedly make this problem more acute.

Since no one can tell where bombs will burst, all areas require an alternate plan which at least provides emergency legal and economic props.

My thought is this. In cities like Washington, for example, if the plan is to evacuate the city, the people would leave, and after some period of time the city would either not be hit and they would return; or, if it were hit, they would go some place else, and they would expect that somebody would take care of them there. If they return, there is no plan for taking care of the people from cities which have been hit. There are many areas in the country on which our survival may depend. Targets hit good and hard will be written off. You have to have somebody left to do the work of the country and I say there should be some emphasis on other than target areas.

The basic problems of civil defense are not temporary. Because we live in a world of changing alliances which has the technical facility for wreaking tremendous damage from great distances by means of superweapons in supersonic carriers, we will always need to be prepared.

Preparations for self-protection are quite natural and the expense and difficulties are by no means prohibitive. In many ways civil de-

fense measures with a dual purpose can contribute measurably to the development of America. Although the public has shown little interest in civil defense this seems to be attributable to the lack of appreciation of the seriousness of the threat and the fact that something can be done. It is not impossible, in other words.

Fear is not a sound basis for logical preparation; prudence and reality are. I believe that a substantial program is needed to inform the public, including schoolchildren, in a calm and reasoned manner about the real dangers of living in this age. It should mention that the United States used nuclear weapons (when there was no fear of retaliation) and that its shores were attacked in World War II (by both submarines and fire ballons).

What do people think as they work away on some tiny bit of our billion-dollar missile program? They must realize vaguely that its object is to kill people—and that somewhere their "opposite number" is working at a similar device which might some day be headed their way.

I believe that they and the public at large would be most receptive to a thoughtful, educational program which supported a reasonable long-range plan for civil defense.

Mr. HOLIFIELD. You don't mean to indicate by this that there hasn't been an educational program by FCDA.

Mr. BASCOM. Well, there has been an educational program. In fact, there is a division of FCDA which very largely deals with educational program. I have been, let us say, disappointed in some of the things that they have said. When I was with the university deciding whether I should come to Washington in the first place or not, I happened to see a television program called Atomic Alert, put out by Motorola Television, and it had a short speech by Mr. Peterson at the end of it, in which he substantially gave it his stamp of approval.

Having seen that picture, my friends and I were so incensed by the things that were wrong with a civil defense which could allow such a program could be put on, that they said, "You better go to Washington to see whether you can do anything about it." After I had been here 6 months I received a notice that FCDA had bought this film, produced a lot of copies and put it out for distribution, so I immediately called and asked that there be a showing in FCDA's office in Washington. I asked that they look at it and see what the trouble was.

We viewed this film in the FCDA headquarters here.

Mr. HOLIFIELD. About when was this?

Mr. BASCOM. I would judge this was about 8 or 10 months ago. I'm not quite sure.

Mr. HOLIFIELD. I was trying to fix it in point of time. Then, will you tell us what the general things were that you disagreed with?

Mr. BASCOM. The details I have kind of forgotten by this time. As I sat there, I made notes on the things I objected to personally. I had 17 substantial items. When the picture was over, nobody said a word. Finally they said, "You are absolutely right. We shouldn't have bought that one."

But this was before it went out for distribution, and it continued to be distributed, and nobody ever did anything about it.

One of the things that the educational program needs is a fund for buying back some of the old films which are still being circulated

around, which are not right, for the purpose of destroying them. Local groups have money invested in them and they don't like to throw them away so they keep showing them.

Since I have been in Washington I have been shown 2 or 3 films by the local civil defense people which are contrary to the things that they are trying to tell the public.

Mr. HOLIFIELD. Are these films obsolete from the standpoint of their concept of the danger? What is wrong with them?

Mr. BASCOM. They were wrong in lots of ways which were technical. They gave the wrong impression in many ways. They deliberately, it seemed to me, fostered the idea that streets would be overrun with howling mobs and that, for example, the shock wave would arrive immediately after the flash, even though they must have spent a lot of money trying to tell people that once you see the flash that you still have some time to take cover from the blast effect. This was the sort of thing they were decidedly wrong on—technically and psychologically. If necessary, I can dig up the old notes and find out exactly what was the matter. I was just giving this as an example.

One of the principal ways the civil defense authorities have for interesting people and educating them about the subject of civil defense is to have test exercises and there is at least the intention of having one per year. I am particularly interested in the one last year since I was fortunate enough to be at the command post and observe close up what was going on. I objected to this exercise in a great many ways and wrote a report on it which pointed these things out. I don't know that anything has been done about correcting them.

Mr. BALWAN. This is an objection to what, to which exercise?

Mr. BASCOM. To exercise "Alert 1955," to the ground rules, to the assumptions, to the ways in which it was carried out.

Mr. BALWAN. Do you have a summary here?

Mr. BASCOM. I have this report. It is a little bit long to go through very much of it now but I might pick out some points in it.

Mr. HOLIFIELD. Give us some highlights on it.

Mr. BASCOM. It used weapons that were fitted to the target. They were judged so they would just exactly saturate the target area with some particular weapons effect, so that the C ring coincided with the outer limits of the city, which, of course, made a very curious situation. Only one weapon was delivered by submarine. This was a 10-megaton weapon delivered against Montreal, Canada. In the entire attack the explosives amounted to 30 megatons. This is just a year ago, well not quite a year ago. It was in June last year. Thirty megatons in the entire attack. The argument that FCDA used was that they should not overwhelm local civil defense groups by posing a problem outside of their present capabilities. This doesn't seem to me to be valid.

In Washington there was a great deal of confusion because they used a one-fifth megaton bomb in this exercise, and it followed close on the heels of a lot of testimony about 10-megaton bombs in Washington, so people were greatly confused.

Mr. HOLIFIELD. Then the evaluation of the damage done——

Mr. BASCOM. It was quite small compared to what had recently been hypothesized.

Mr. HOLIFIELD. Those bells indicate a rollcall. We will have to adjourn and we will ask our witnesses to bear with us and we will

come back. It will probably take 30 to 40 minutes. We would like to continue. The Members will have to go to answer the rollcall. This is the penalty of carrying on in the afternoon.

RECESS

Mr. HOLIFIELD. I am happy to announce that there will be no more rollcalls this afternoon. We thought there would be another one. We will proceed. The subcommittee will be in order. You may finish your testimony, Mr. Bascom.

Mr. BASCOM. Yes, sir. I was talking about the difficulties in Operation Alert last year. Only 14 of the 60 bombs were ground bursts. None of these in New England where the bomb concentration was highest. In spite of the statement in their planning assumptions that "It is regarded as probable that this type of burst, namely, nuclear weapons detonated at or near ground level, would be used for such attacks."

There were no attacks between Kansas City and Los Angeles, nor were any assumed to be made on the basis of military retaliation, although that is also in the planning assumptions.

Mr. HOLIFIELD. There is a high probability that military targets would be primary targets.

Mr. BASCOM. Yes, indeed. That is what I meant to indicate. The high probability that our defenses would bring down enemy aircraft whose weapons would explode was not considered. By not making such assumptions, the chances to bring three important concepts before the public was lost: (1) that civil defense is everyone's business and no place is secure from enemy attack, and (2) bombing of military bases will probably produce fallout which will materially influence civil defense action; and (3) regardless of assumed targets and statistical winds, anyone may turn out to be downwind in the fallout from an inadvertent explosion.

Many of the senior participants in the test did not seem to properly anticipate weapon's effects and almost invariably blast, thermal, and fallout effects were underestimated. For example, although 3 1-megaton bombs were burst in the Los Angeles area, the aircraft production lines were said to have been undamaged. Although these plants may have been outside the C ring—which is defined in another way as 3 pounds per square inch—a shock-loading of 1 to 2 pounds per square inch on the vast wall and roof areas would certainly have caused very serious damage.

This helps to point out that the concept of the A, B, C, and D rings has some use for planning and explanation; unfortunately, they have taken on an air of false reality, and the impression persists that things are not so bad outside of a zone that is called total destruction.

There was no appreciable element of surprise in that test, and although several large cities such as Detroit, San Francisco, and Philadelphia, were omitted from the preattack list, this elementary subterfuge fooled no one.

Daytime mid-June was selected for the test and although this does have some advantages, among the disadvantages is the point that weather has a high probability of being good. Windows are open, warning signals can be heard, school is over in most places. Few

people have gone on vacation or to unfamiliar locations. Evacuation, if tested, will be comparatively easy.

In accessing the results, it must be constantly kept in mind that they are far from comparative with those of a winter night.

I think I had better not go much further into this report because I have taken a lot of time with it already. I would like to point out that I ended up with specific recommendations for things that should be done. It was constructive, I hope, since I suggested that detailed planning for nationwide civil defense exercises is a big job and a few men working on it concurrent with their regular jobs cannot be expected to prepare a plan which is worthy of the tremendous effort that goes into carrying it out. A permanent group with the full-time job of designing tests and practice exercise needs to be created. They should use up-to-date planning assumptions and have the freedom to introduce the element of surprise so they can produce an exercise plan which would look real enough to be supported actively—instead of by lip service—by the press and the public.

There is more to this report which I won't bother you with, but at the time I wrote this, which was shortly after June 15 last year, I immediately turned it over to the senior people in FCDA, and they indicated that they thought my ideas were correct, and that this would be a valuable thing to do. If there has been any movement in that direction so far, I haven't seen any indication of it yet.

Mr. BALWAN. I have a question at this point. Are these reports of the committee, are they adopted by the civil defense advisory committee of the National Research Council or are they your own personal reports?

Mr. BASCOM. We have two kinds really. A study like this of Operation Alert is intended to be a factual summary. We try to get the facts. It doesn't contain any opinions and I have called these personal reports.

Our more important reports, such as the policy statement and the research statement, were acted upon by the committee as a whole which underwrites the things that are said.

Mr. BALWAN. What status do your personal reports so-called have with FCDA?

Mr. BASCOM. Well, they are characterized by the fact that they are not sent to Mr. Peterson with a covering letter, whereas the other reports are.

Mr. BALWAN. Are they formally transmitted to the FCDA?

Mr. BASCOM. No; they are informally transmitted. They are simply mailed to them or in many cases handed by me to senior people, and then generally distributed to other people throughout the agency interested.

Mr. BALWAN. Could they have been reports adopted by the committee, if they felt they were important enough for transmittal to the administrator?

Mr. BASCOM. As I said, we had two reports that were important enough, they were transmitted that way. The others are sort of staff studies. They are the facts as near as a staff man can find them out in the time we were able to put in on them. They were not exactly adopted formally by the committee. I stand the responsibility for those myself.

Mr. BALWAN. Was the committee advised at all that you were making such reports?

Mr. BASCOM. Yes, indeed. Our committee members get the first copy and get an advance draft for criticism.

Mr. BALWAN. But they don't put their stamp of approval on it as having been adopted by the committee?

Mr. BASCOM. That is correct.

Then to sum up, I have said on this last page, United State civil defense needs plans which look beyond the immediate threat; it needs a warning system, a shelter program, a dispersal plan, a radiological defense, a means of communicating with the public in an emergency. And it needs an educational program which can at least inform the public of the danger and tell them what they must do to protect themselves.

In short, the United States needs a real civil defense.

Mr. HOLIFIELD. Are there any questions?

Mr. LIPSCOMB. Mr. Chairman, I would like to find out just a bit more about the committee. How often do they meet? Is it the Civil Defense Advisory Committee?

Mr. BASCOM. Yes, sir.

Mr. LIPSCOMB. How often do they meet?

Mr. BASCOM. There is not a simple answer to this question. There are no regular meetings stated long in advance. When there is something important to meet about we have a meeting. Besides the full committee we have broken down into panels and the panels have met more often than the committee as a whole has met. We have telephone conferences from time to time. I probably see certainly 1 or 2 committee members every week, depending upon what the circumstances are and we are working on at the time.

Mr. LIPSCOMB. How often have they met and had formal action on a report?

Mr. BASCOM. Three times.

Mr. LIPSCOMB. And those reports were transmitted to civil defense, to Governor Peterson.

Mr. BASCOM. Yes.

Mr. LIPSCOMB. Have we received these three reports, Mr. Chairman?

Mr. HOLIFIELD. They have been introduced today.

Mr. BASCOM. And they are starred in the record, I believe.

Mr. HOLIFIELD. Has the staff had those reports beforehand?

Mr. BREWER. We have had some of them, not necessarily all.

Mr. LIPSCOMB. How large a staff does the committee have?

Mr. BASCOM. It has me, and I have a secretary, and we have associates and consultants from time to time. At the moment we have one other person working with me immediately on the staff.

Mr. LIPSCOMB. You are considered a staff member?

Mr. BASCOM. Yes, sir.

Mr. LIPSCOMB. Does the committee have to authorize the studies that you make, such as this last one, or do you just initiate studies on the subjects you feel desirable and needed?

Mr. BASCOM. I generally think of the things that should be studied and go ahead and do them, usually after talking to Dr. Tuve about it. Sometimes it depends on what kind of people we can get hold of. There are a lot of things I can think of to study, but we can't find

the right people to do them on a temporary basis; so it depends on lots of circumstances which subjects we study.

Mr. LIPSCOMB. Where do the funds come from that you operate with?

Mr. BASCOM. We are under contract to the Federal Civil Defense Administration to advise them—and I read part of the contract this morning. Of course, they are supposed to submit various problems for us to work on. As of now, they have never submitted to us a research program—budget—and that was one of the reasons that our committee was set up in the beginning. We were supposed to review their program at least before it went to the Congress. I have yet to see the first one. The contract also says they will request us to do eight items per year. If we stretch our imagination, we can find three things we have been specifically requested to do in a year and a half of operation.

Mr. LIPSCOMB. How much is the appropriation you now receive?

Mr. BASCOM. The first year's appropriation was $30,000. This year, the present year, it is $40,000.

Mr. HOLIFIELD. On the status of your organization, you are then consultants on a contract basis to the FCDA?

Mr. BASCOM. That is correct.

Mr. HOLIFIELD. And the information which you have given us today has in one form or another been presented to them?

Mr. BASCOM. Yes, sir; over and over again.

Mr. HOLIFIELD. And in most instances, you have indicated that there was agreement, basic agreement, with the reasonableness of your presentation but, as I understand it, you are complaining because many of them have not been carried out.

Mr. BASCOM. I am sorry if I seem to be complaining at all. You have asked for the facts and I am trying to give them to you the best I can. I am trying not to be malicious in any way about this.

I have great respect for some of the people in the Federal Civil Defense Administration. There are a lot of Government groups to blame for the difficulties in civil defense today.

Mr. HOLIFIELD. I inadvertently used the word "complain." I should have said you are criticizing the lack of followthrough on some of these recommendations.

Mr. BASCOM. Well, it seems to me that the way you decide what to do is to look at what you are already doing and see if it is right. Then, having decided whether it seems to be a good thing or not, you can determine some alternative to it.

Now the accent this morning was put on my criticisms of civil defense, whereas I was only trying to point out that things don't seem to be going as well as they might be, and that there are other things which can be done instead—which look to me as though they might be better.

Mr. HOLIFIELD. Under the terms of your contract are you or are you not supposed to point out what you consider deficiencies, wrong methods, and to suggest better ones?

Mr. BASCOM. Well, as I understand the contract, we are supposed to do that. We are supposed to advise the Federal Civil Defense Administration on the things that they should do and, in my view, that covers what we are doing.

Mr. HOLIFIELD. Has the Civil Defense accepted and put into effect any of the recommendations of your group?

Mr. BASCOM. Yes, I think they have. It is spotty. In many cases, they don't really seem to understand what we are talking about, although we have tried over and over again to explain the necessity for certain kinds of research and for systems analysis.

For example, the University of California project about which I spoke this morning is a direct outgrowth of a good deal of hard work by FCDA and by our group together to get somebody into the radiological defense business. The project will support FCDA by bringing together people who already have the real knowledge about radiological defenses that exist in the country today.

Mr. HOLIFIELD. Are the fields in civil defense planning where technicians are needed?

Mr. BASCOM. There certainly are, and one of the real difficulties of civil defense has been in locating and persuading good technical people to go to work for them.

Mr. HOLIFIELD. Why is that? Why is there a hesitancy to go to work for FCDA?

Mr. BASCOM. Well, I think the morale of the agency is generally pretty low and many of the people I have talked to simply refused to talk about going to work for FCDA although they would have presumably received more money and been at a generally better grade in the Government.

They just didn't want to be part of Federal civil defense—and it was not because they didn't believe in civil defense either. At one time or another, we have submitted quite a long list of names of prospective employees.

On various occasions I have persuaded people who were willing to go to work for FCDA to go down and fill out the appropriate forms but they have simply not been hired—even though they seemed to me to be very good people indeed—young doctors of philosophy who knew about physics, engineering, sociology, and so forth.

Mr. HOLIFIELD. In the organization chart, are there vacancies which have not been filled?

Mr. BASCOM. Yes, I think there are a great many vacancies in the organization chart but it is probably more appropriate that you ask FCDA about which ones. My feeling is that in the research staff where I have known more about what they were supposed to be doing than the others they are particularly short-handed. My recollection is that on several occasions, I have been asked to find as many as five people at a time, technical people generally in the higher level Government grades, who would go to work on the research staff. At one time, we had them located as a group, in fact, but they weren't hired.

Mr. RIEHLMAN. Let me get this straight. You were asked by Federal Civil Defense to secure these people?

Mr. BASCOM. Well, to locate them; that's correct; yes, I was in two different ways by different people, namely, by Ralph Spear, the head of the planning staff in Washington, and by Harold Aitken, who is the executive head of the Battle Creek organization.

Mr. RIEHLMAN. You mentioned that the morale of the people in the organization was very low. Let's see if we can pinpoint that. What is the reason for it, can you tell us?

Mr. BASCOM. Well, some of it, of course, is in the general public feeling toward the civil-defense organization. Much of it is within the staff itself.

I think there is a feeling of doubt that a man could go to work there and really accomplish something in the face of what we might call possible reactionary attitudes on the part of the rest of the staff. That is a subjective thought on my part.

Mr. RIEHLMAN. Do you think that if the position of the Director was raised to a higher level and greater recognition was given to that organization, that it would lift the morale of the people?

Mr. BASCOM. No I don't if that was all that was done. There would have to be much more intensive steps taken than simply raising the budget or changing the level of the Director or increasing the staff.

Mr. RIEHLMAN. Let's get to the core of it. What have you got on your mind?

Mr. BASCOM. I think they need people mostly and a good deal of them need to be new, in the sense that they would be a nucleus of people with new ideas who can take a fresh approach to the problem. Who don't start with any built-in thoughts about what should be done, but really take a fair look at civil defense and come out with an objective answer about what action should be taken.

Mr. RIEHLMAN. Have you been around? Has your contact been broad enough with these people that that appears to be a general situation?

Mr. BASCOM. Yes, sir.

Mr. RIEHLMAN. You are on contract with Federal Civil Defense and your great interest in it leads me to ask, and because of your sincerity in your approach today, have you talked this over with the people in Federal Civil Defense?

Mr. BASCOM. Yes, sir.

Mr. RIEHLMAN. Have you ever talked with the Governor about it directly?

Mr. BASCOM. I have not talked to the Governor on this subject. I certainly talked to Harold Aitken on two occasions—almost a year ago right now.

Mr. RIEHLMAN. The reason why I am trying to pinpoint this, Mr. Chairman, is that it is an important thing, and I think if this man is under contract and he knows of weaknesses he should bring them to the attention of the Administrator.

Mr. HOLIFIELD. Just a minute, let's find out who Mr. Aitken is. The name is new to me.

Mr. BASCOM. Mr. Aitken's title is Executive Assistant Administrator; he is the head of the Battle Creek organization.

Mr. HOLIFIELD. Then he is second in command?

Mr. BASCOM. Yes, sir. However, most of these reports; for example, the two major committee studies, the policy statement and the research program, I personally went over in great detail with Mr. Peterson himself.

Mr. RIEHLMAN. That is on two of the studies?

Mr. BASCOM. That's right.

Mr. RIEHLMAN. And has that been the policy? I thought that we understood at one time that the reports and the studies were submitted with a covering letter.

Mr. BASCOM. Well, that is a formality; besides doing that I also go to see him personally.

Mr. RIEHLMAN. And you have gone and discussed it with him yourself?

Mr. BASCOM. Yes, sir. And, for example, on the research program when I talked to Mr. Peterson, Mr. Aitken and Mr. Goodwin were also present there; they are the top people——

Mr. RIEHLMAN. Now you are talking about Governor Peterson, Mr. Aitken, who is his assistant, and then who is the next one?

Mr. BASCOM. Harold Goodwin. He was Director of Test Operations. He is now special consultant to Governor Peterson.

Mr. HOLIFIELD. What was their attitude? Was there substantial agreement with your position or can you say?

Mr. BASCOM. There certainly seemed to be at the time, in fact, I thought they were enthusiastic about it at the time.

Mr. BALWAN. About what?

Mr. BASCOM. About the research program and about the ideas that were outlined in it.

Our idea, of course, would be that it would be carried out with the money that had just become available to them because the program which they presented to Congress, that is, for the additional $2 million supplemental research budget, did not seem to me to be well thought out at all, and I expressed these views to them, too. What the committee tried to do is to present something that could lead to a substantial improvement in Civil Defense effort.

Mr. RIEHLMAN. What was that statement you made regarding a supplemental appropriation?

Mr. BASCOM. Last year, just before the end of the fiscal year, there was an extra bill, a supplemental appropriation, which the Federal Civil Defense Administration asked for. I believe the sums requested were roughly $10 million and $2 million which were for so-called survival planning studies and for research.

Mr. RIEHLMAN. You did not think that was a realistic amount, is that right?

Mr. BASCOM. I did not object to the amount. I think these programs, such as they were, were slapped together in pretty much of a hurry without having any real thought going into the research program. What we tried to do was to buttress this up with some really useful things that the money could be spent on.

Mr. RIEHLMAN. Who slapped this thing together? Who is responsible for that?

Mr. BASCOM. I am sorry I can't answer that question.

Mr. RIEHLMAN. Where did you get the information from that it was slapped together?

Mr. BASCOM. I saw the program and had a chance to discuss some parts of it with Ralph Spear, of the planning staff. My impression from this was that it was a carefully thought-out program.

Mr. RIEHLMAN. That is kind of a loose way to put it, isn't it, slapped together?

Mr. HOLIFIELD. I think that one of the reasons why in the past, at least, this excuse has been given on the floor when Civil Defense appropriations were considered, one of the reasons why Congress has not been more liberal or more generous with their appropriations, has been the general feeling on the part of the Members of Congress that there wasn't an adequate plan or an adequate program to justify additional appropriations.

In talking to the members of the Appropriations Committee that cut it over the years, and I am not just speaking about the last year, I am speaking about a period of 5 or 6 years——

Mr. RIEHLMAN. If you will let me interrupt, I will agree that that has been one of the chief criticisms ever since the inception of Federal Civil Defense. It has always been a question of an inadequate type of program that the Congress has been presented to act upon.

Mr. HOLIFIELD. I think part of the apathy and indifference of Congress can be attributed to that. I don't say that in excuse for Congress because I think possibly this study should have been made earlier by Congress and a more vigorous program demanded as we demanded it of the Atomic Energy Commission time after time when they came up with an inadequate program. The Joint Committee on Atomic Energy sent them back to work on their programs and come back, and they did come back with more ambitious programs and, as a result of that, we developed much faster in the field of weapons and peacetime applications than we would have if we had rested upon their original programs that they presented to the Congress.

Mrs. Griffiths?

Mrs. GRIFFITHS. I would like to ask you, do you think that the people who are running Civil Defense, not necessarily Mr. Peterson, but others within the organization who have authority, don't believe that Civil Defense is possible, or just not necessary?

Mr. BASCOM. I have been tempted to believe that. Mostly, I would like to say that I really think that the people in Civil Defense have worked hard and have really done the best that they could under what they conceive to be the ground rules and the conditions under which they work, but I think they were simply not up to the job of overcoming the basic difficulties and still having an imaginative program that they could follow, too.

Mr. HOLIFIELD. You have studied the two bills, the one seeking to make a Cabinet position and to do certain other things and the other one seeking to place the agency in the Department of Defense.

Without going into an elaborate study of the points at this time, have you given any thought to the two different principles involved in those pieces of legislation?

Mr. BASCOM. I have given it some thought, but I feel that I am a technical man and I had better disqualify myself on that subject.

Mr. HOLIFIELD. Well, we have before us now a letter of January 16, apparently signed by you, in which you say:

> I believe that all aspects of nonmilitary defense should be consolidated into a single agency and placed under the Department of Defense on an equivalent basis with Army, Navy, and Air Force.

Mr. BASCOM. Generally, that is my opinion, but I would not like to pretend that I am competent to really judge where this thing should go in the Government. If I was forced to make a decision, that is what I would say, but I think that we had better have a substantial group of people that know a lot about the Government make a study to find out how it should best be done.

Mr. HOLIFIELD. From an organizational standpoint?

Mr. BASCOM. Yes, sir.

Mr. HOLIFIELD. You go ahead and say:

> Then civil defense would look like defense to the public and it would benefit from the strong existing organization. Within this new group the emphasis

should be placed on the assembly of planners who are competent to devise the physical, legal, economic, and sociological measures which are needed. If provided with specific plans, I believe the Congress would shoulder its responsibility by passing the required legislation and appropriating the necessary funds.

Mr. BASCOM. As near as I can tell, every word of that is true and I believe it. I am simply saying that you had better get better advice than from me on that subject.

Mr. HOLIFIELD. I think that is very frank of you to qualify your statement on the basis of your background and knowledge of the subject.

Are there further questions?

Mr. RIEHLMAN. You say you are not qualified in this field, although you have made the statement, you are not willing to back it up?

Mr. BASCOM. I beg your pardon; which statement?

Mr. RIEHLMAN. I say this statement with respect to placing it in the Department of Defense. It is just a shot at it. You are not convinced deeply that that is where it should be.

You are saying it and yet you are not convinced yourself that you have authority to speak in respect to whether or not it should be placed in the Department of Defense.

Mr. BASCOM. You only offered me two possibilities; at least that is what it amounted to. You asked me whether it should be a new Cabinet position or in Defense; of those two choices my opinion is, and I will give it to you, that it should probably be in Defense, for the principal reason that it would start looking like defense to the people of the country. I don't think that civil defense does look like part of the national defense right now. I consider that to be a great advantage. Whether this is outweighed by other things I do not know but I wouldn't retreat from that position for one moment.

Mr. RIEHLMAN. I guess that is all.

Mr. HOLIFIELD. At this time, as long as I have quoted from your letter, sir, in justice to you, I think we should insert the complete letter of January 16 from you to the subcommittee.

(The letter of January 16, 1956, referred to is as follows:)

NATIONAL ACADEMY OF SCIENCES, NATIONAL RESEARCH COUNCIL,
ADVISORY COMMITTEE ON CIVIL DEFENSE,
Washington, D. C., January 16, 1956.

Congressman CHET HOLIFIELD,
House of Representatives, Washington, D. C.

DEAR CONGRESSMAN HOLIFIELD: I am pleased that you have asked for my views on the matter of what is wrong with the present United States civil defense effort and what should be done to improve it; a summary of my ideas follows:

Civil defense is a much neglected part of total defense for which the Federal Government is clearly responsible. Civil defense is necessary, since there can be no absolute military defense; effective measures are possible. The actions required are inconvenient and expensive—but bearable.

The most important deficiency today is the lack of technically qualified people to make foresighted and reasonable plans (engineers, lawyers, economists, scientists, sociologists). The present budget level, although grossly inadequate for a real civil defense, would be generous if properly used for the research, the planning, and the experimentation which must come first anyway.

There are no plans that make anything like adequate provision for such fundamental needs as a widespread and rapid public warning system or an effective dispersal program. The deficiencies in the planning for shelter, communications, public education, evacuation, and test exercises are apparent even to casual examination. Generally, long-range measures of more permanent value have been neglected in favor of dubious interim procedures.

I believe that all aspects of nonmilitary defense should be consolidated into a single agency and placed under the Department of Defense on an equivalent basis with Army, Navy, and Air Force. Then civil defense would look like defense to the public and it would benefit from the strong existing organization. Within this new group the emphasis should be placed on the assembly of planners who are competent to devise the physical, legal, economic, and sociological measures which are needed. If provided with specific plans, I believe the Congress would shoulder its responsibility by passing the required legislation and appropriating the necessary funds.

I enclose copies of some of my writings on the subject of civil defense which define my views more clearly. If you wish, I will be glad to amplify these remarks and support this brief statement with facts.

Yours very truly,

WILLARD BASCOM, *Technical Director.*

Mr. HOLIFIELD. Do they have a research director in civilian defense that you would ordinarily sit down and talk this matter over with?

Mr. BASCOM. Yes; they do. His name is Wayne Johnson. He has been in this job, I guess, for about 6 or 7 months by this time.

By the way, it might interest you to know that both Dr. Taylor, one of our committee members, and myself, were repeatedly offered this position. We felt it would probably not be possible to work effectively within the FCDA and so we did not accept this position.

Mr. BALWAN. How do you wind your sentence up?

Mr. BASCOM. I said we thought we couldn't work effectively within the FCDA, so we did not accept this position.

Mrs. GRIFFITHS. Why not?

Mr. RIEHLMAN. Mr. Chairman, I would like to follow that a little bit. Let's find out what is wrong here.

You have made a lot of statements and the subcommittee wants some facts in connection with them. Now if there is something radically wrong in Federal civil defense we want to know it.

You made a statement here that annoys me. With your background, and your wide field of experience, you have had a tremendous number of activities in Federal civil defense, and you have taken positions that have been very critical of it, and you have tried to give some anwsers to them. Now you still say that there are things that are going on so that you cannot work effectively down there and you wouldn't. I think the committee is entitled to know what is wrong. What is the situation that you are aiming at?

Mr. BASCOM. I think you have misunderstood something. I said work within the Federal Civil Defense organization. Now I don't consider myself to be working within that organization now.

Mr. RIEHLMAN. You have been asked to take a job there?

Mr. BASCOM. Yes.

Mr. RIEHLMAN. Or to take a position there; let's put it that way?

Mr. BASCOM. All right.

Mr. RIEHLMAN. You say you couldn't work effectively there. Now what is the reason?

You are working for them on a contract basis and you are feeding information to them. You are supposed to on the basis of information that you and your staff or committee have gotten together. Now what is wrong? There has been a constant inference, at least in my thinking, that there is a great difference of opinion, apparently. Is it a personality clash or is it that someone in the department is not willing to accept your suggestions, or what?

Do you just feel that this thing is not working and it can't work, and the personnel is wrong, it is at a low ebb, and all the rest? I think this committee is entitled, Mr. Chairman, if he has these feelings, to have them pinpointed, and let's get at the bottom of them because we just don't want unsupported statements. We want facts and we want to pinpoint them so that we can do something constructive about it. You are the man who can give us that if you have the ideas. You and the other people that are working are the ones that have that knowledge, and we should know about it.

We are worried about civil defense or we would not be holding these hearings, and we want to do something constructive about it but we just don't like to have statements about something being wrong, and then not pinpoint it and get to the basis of it.

Now, if it is a personality conflict or if there are people that you are really and truly upset about in the civil defense organization, this committee should know something about it.

Mr. BASCOM. Well, I feel that one person going into the organization——

Mr. RIEHLMAN. I say that, in all fairness to your position, I think the chairman knows, and I think every one of the members of the committee knows, that we are not here just for the sake of holding a hearing.

We are here to get some facts and we are just as much interested in correcting what is wrong in civil defense as you are, if there is something wrong there. And when we get these things thrown at us, I think it is about time that we got right to the bottom of it and got right to the core of it, and I repeat again I am definitely interested in knowing what you have on your mind about this situation.

Mr. BASCOM. First of all, I think there is no personality clash, although there might be after today, but my feeling was that one person or even a couple of people could not work effectively.

My general feeling is that many of the people at the assistant administrator level have really not understood the technical problems well enough to act on them. There has to be more than one person to do something.

The problem is to attract a nucleus of people, at least a half a dozen, who can start working on these things as a unit.

Mr. RIEHLMAN. That is your personal opinion, isn't it? I mean that the Assistant Director and from there on down they just haven't got people that understand the technical problems. That is your opinion?

Mr. BASCOM. I haven't made a blanket statement like that but in most cases that is true.

Mr. RIEHLMAN. Now have you discussed that with the other members like Dr. Tuve and other about this?

Mr. BASCOM. We certainly have, many times.

Mr. RIEHLMAN. And that is their general opinion, too?

Mr. BASCOM. I think you had better ask Dr. Tuve——

Mr. RIEHLMAN. Mr. Chairman, I think it would be very helpful to us, and the staff should remember this, that when Federal Civil Defense comes before us, in view of the statements that have been made,

that we have a complete list of the people and their background and caliber in this field of activity.

We really want to know what is going on here, and the way we will get it is to know who we have got and who we haven't got. When we pinpoint it, then we will know something about what we are talking.

Mr. BASCOM. I think that is an excellent idea.

Mr. HOLIFIELD. We will ask for that list and we will qualify each witness before he testifies, just as we have tried to qualify Mr. Bascom today. We will certainly ask for that list.

Mrs. GRIFFITHS. Were you offered a specific job?

Mr. BASCOM. Director of Research.

Mrs. GRIFFITHS. And to whom would you have reported?

Mr. BASCOM. As it was then set up, it would probably have been to Ralph Spear.

Mrs. GRIFFITHS. And do you feel he would not have carried on the ideas, would not have given you sufficient authority?

Mr. BASCOM. On the contrary, I have the highest regard for Ralph Spear and I think, in the main, he would agree with the things that I have said here this morning.

Mrs. GRIFFITHS. But at some point along the line, nothing would have happened?

Mr. BASCOM. One of the difficulties is that the research program is really not controlled by the Research Director. As a matter of fact, in some cases he did not even seem to know about research projects that are going on. Within the last 2 months he has told me of research projects which had originated, been thought out, and O. K.'d by Mr. Aitken without his ever having seen them.

Mr. RIEHLMAN. I think those are statements, Mr. Chairman, that we will want to check very carefully.

Mr. HOLIFIELD. I think so, too. It indicates a lack of coordination if this is true.

Mr. RIEHLMAN. That is this gentleman's judgment.

Mr. HOLIFIELD. Yes; and we must grant him sincerity of purpose in his testimony until it is proven otherwise, and we will certainly give the Federal Civil Defense people a chance to answer anything he said. The testimony will be available to them as soon as the reporters finish the transcript.

At this time, if there are no further questions of Mr. Bascom, we will proceed to allow Dr. Tuve to make his statement, and I would suggest, Mr. Bascom, that you remain because there may be questions that come up.

Mrs. GRIFFITHS. Are you going to furnish the committee with a copy of those reports?

Mr. BASCOM. Yes, ma'am.

Mr. HOLIFIELD. I believe you pretty well qualified yourself on the opening page of your statement, Dr. Tuve, so I won't attempt to explain to the assembled group your background, but you might give it. You have a prepared statement, I see. You may proceed.

STATEMENT OF DR. MERLE A. TUVE, DIRECTOR, RESEARCH LABORATORY OF CARNEGIE INSTITUTE OF WASHINGTON, AND CHAIRMAN, COMMITTEE ON CIVIL DEFENSE, NATIONAL ACADEMY OF SCIENCES, AND THE NATIONAL RESEARCH COUNCIL

Dr. TUVE. Gentlemen, my name is Merle A. Tuve. I have been a resident of Chevy Chase, Md., for about 25 years. I am director of one of the research laboratories of the Carnegie Institution of Washington, and Chairman of the Committee on Civil Defense of the National Academy of Sciences and the National Research Council. This Committee is, of course, a special group of technically qualified citizens who serve without pay.

I am speaking today as an individual citizen and not on the basis of advice from our Committee. It has not been possible to have meetings enough to present directed testimony from the Committee on this occasion. During the war I had charge of the work on the proximity fuse, which was used for antiaircraft in the Pacific, the Battle of London, and in Europe, and for artillery bombardments with several million shells, and especially in the Battle of the Bulge. I have served on numerous civilian advisory committees and projects, including projects Hartwell, Lincoln, and others, the Killian committee and advisory posts for the Secretary of War and other officials. Prior to the war my work was chiefly in nuclear physics, and I was a member of the original S–Committee set up by President Roosevelt in 1939 for the utilization of uranium fission.

Mr. BALWAN. Mr. Chairman, may I ask a question that stems from our discussion this morning with Mr. Bascom?

You mentioned a Killian committee. Could you elaborate more on who set the committee up and who was responsible, and to whom they reported and on what they reported, generally, the topics?

Dr. TUVE. I will have to think now. Even the existence of the committee was secret for some time and I will have to review how much I am free to say.

The Killian committee was set up at the request of President Eisenhower in the Office of Defense Mobilization under the scientific adviser to the President, Dr. DuBridge.

Dr. Killian took leave of absence as president of MIT, spent 6 months and Jim Fisk, the vice president of the Bell Telephone Laboratories, also spent 6 months on leave of absence for the work of this committee. I believe the subject of their work is still classified.

Mr. HOLIFIELD. I was going to suggest, we are going to have Dr. Killian before us and we will give him an opportunity to explain that.

Dr. TUVE. It was concluded about a year ago. There have been several Killian committees but that is the particular one I referred to.

Mr. BALWAN. Since it was mentioned in here——

Mr. HOLIFIELD. As far as I am concerned, Hartwell and Lincoln were also mentioned. Were Projects Hartwell and Lincoln also along the line of background?

Dr. TUVE. They are defense activities.

Mr. HOLIFIELD. Background defense activities?

Dr. TUVE. Yes.

Mr. HOLIFIELD. Which would qualify you to present your views?

Dr. TUVE. That is correct. Hartwell concerned submarine activities, Lincoln concerned air defense of this country.

The activities in the area called civil defense are the only defense activities of our Government that I know about which seem to be based today, and have been based for several years, squarely on the proposition that war is not coming. The office activities of the FCDA, the budget hearings in Congress, the newspaper reports of our erratic and inconsequential Government preparations, the local drills and test exercises, the careful avoidance of civil-defense matters by our Air Force and our AEC, despite their daily concern with the devastatingly grim facts of nuclear warfare, all this adds up to a contradictory and irrational situation, and it is recognized as such by the man in the street.

As members of the Military Operations Subcommitte you gentlemen know how deadly serious we are about our capacity for military offensive action, and on a moment's notice. You also know how foolish it is for us to expect to destroy more than half of a massive attacking force.

Mr. HOLIFIELD. At that point I am going to ask you to stop for just a minute, because I did want to ask one question of Mr. Bascom, and that bears directly on this point here.

I was amazed when I read in your testimony, Mr. Bascom, the following language:

> The lack of any substantial civil-defense effort is remarkable, since military men have testified that our defenses which are made up of radar lines, fighter aircraft, Nikes, and other missiles could bring down perhaps 70 percent of attacking aircraft.

And I meant thoroughly to question you on that and ask you if that was a typographical error, or if you made that—I have never heard that testimony. I have never heard the most optimistic military man say that they could knock down 70 percent of an attacking force.

Mr. BASCOM. Well, there have been a very wide range of guesses about what it might be, and I picked one that was near the upper end, just to be sure that we would not get in any conflict with military people.

Most of the estimates, as you say, are far below that; in fact, General Vandenberg said 30 percent and this has been said in various ways since then. It seems to me this number does not have any special significance; the point is that a great many planes can get through. Thirty percent is an awful lot of planes and this is an assumption, anyway.

Mr. HOLIFIELD. I want to put that in proper perspective with Dr. Tuve's remark here because I am more inclined to go along with Dr. Tuve's remark on this end, from the background information and testimony that I have heard.

Excuse me for interrupting you but I meant to ask you that question before Mr. Bascom went off the witness stand. Will you proceed, now.

Dr. TUVE. Yet as residents of the Nation's Capital you know that you have no idea what you or your family should do at once, or in the course of the afternoon or tonight or tomorrow or next week, if a yellow alert were to sound right now. Whether bombs struck here

or not, you and your family, your office, my office, the Congress, the businessmen, the entire city would be paralyzed and helpless, without even information as to what they might constructively do. There are quite desperate and obvious contradictions in our present attitudes toward our ability to destroy others and our ability to preserve ourselves from the same agents of destruction.

Perhaps we are taking our time about civil defense by reason of a subconscious recognition that it creates a new dimension of human relationships, that the threat of nuclear war is a threat we must live with for at least a hundred years, and perhaps 500 years. If we are fortunate enough, and no war occurs in the near future, maybe we can take long years to prepare ourselves for this threat. But eventually we must face it. Complete atomic disarmament is no longer anything but a romantic dream. There is not the slightest hope that civilized nations will destroy, by common consent, their ability to carry out nuclear warfare, for the simple reason that the total stock of explosive material is already far too large for any detailed accounting. Limitation of arms is one hope of all reasonable men, and this would reduce nuclear warfare initially to perhaps a few hundred stupendously big bangs. But we must face the fact that it takes only 50 or 70 of such explosions to make large parts of the United States temporarily unlivable, if they can be delivered. The physical devastation, however, would be very much less impressive than the deaths among our people, the injured survivors, and the disruption of the entire fabric of our society, which will be inevitable unless we make perhaps a hundred times more preparation than we have to date in the area of civil defense.

The stakes are high. Any nuclear war will inflict grave damage, but 80 percent of the casualties and deaths can be avoided, and a workable society can rise again promptly, to still stand for the ideals of our American state, if reasonable preparations are made. A civil-defense effort costing several billion dollars and spread out over a few years may mean a difference of 60 million casualties or more in the event of an all-out war.

The situation has led many people to reject the possiblity of war, or to say that if nuclear war comes they want to be among the first to go. This is an error of desperation, for even modest preparations, and much of that in the form of public information, will allow most of the people of this country to survive, do useful work, and live happy lives. There is not the slightest doubt in my mind but that I want to be one of the survivors if war should come. Our failure to provide an adequate civil defense also ignores the very important value in international negotiations of being prepared for survival and for the continuation of civil effectiveness regardless of any threatened destruction. This may well be the final deterrent to any war.

I am somewhat puzzled as to why the Congress must reinvestigate the needs of our civil-defense preparations before initiating some action to strengthen it. The existing absurdities in our governmental situation must be as obvious here on the Hill as they are elsewhere.

Mr. BALWAN. Mr. Chairman, may I interrupt here to ask Dr. Tuve how he classifies, in his opinion, the present concern of Congress and the particular subcommittee?

Mr. HOLIFIELD. In other words, are you referring in your——

Dr. TUVE. This is constructive. I classify this as constructive.

Mr. HOLIFIELD. Are you referring to this committee's work of investigating this?

Dr. TUVE. Of course not. I give a couple of examples of what I regard as absurdities in the overall governmental situation in the United States.

Mr. HOLIFIELD. Do you think if this subcommittee goes into a thorough and complete investigation of this whole subject, calling in qualified witnesses from the scientific field——

Dr. TUVE. It can be tremendously helpful.

Mr. HOLIFIELD. The military field and the governmental field, as well as the public directors of civil defense in the different target areas, and obtain their experience, do you think that that is a justifiable program, or do you think it is an idle project on our part?

Dr. TUVE. It is highly justified and encouraging, very fine.

Mr. RIEHLMAN. Mr. Chairman, I am not quite clear in your explanation of that sentence, Doctor.

Dr. TUVE. I haven't reached the explanation, yet.

Mr. RIEHLMAN. Are we going to find it?

Dr. TUVE. Yes; in the next sentences. The next sentences comprise examples that look to me to be absurdities.

Officials in our highest emergency agencies have given the green light, officially and publicly, to half a billion dollars worth of new construction between the White House and the Pentagon. Furthermore, these structures are to be financed with money from our insurance companies, and this is done in order to restore the real-estate values in a so-called depressed area. Congress itself several years ago disapproved the proposals for the dispersal of Government agency offices to a ring around Washington.

We have publicly known the vast extent of dangerous radioactive fallout since March 1954, when the Japanese announced it, but no instruments for the measurement of fallout are available in most localities today.

Mr. BALWAN. How about Washington, D. C.?

Dr. TUVE. We have some in special laboratories here. Do you know of any?

Mr. BASCOM. No, sir. I think there are very few in the Washington, D. C., area. As an experiment we tried to get one.

Dr. TUVE. I usually have one in my pocket, and there is one in the room here, but I don't believe it has a thing to do with civil defense activities. Here is one.

Mr. HOLIFIELD. Is there a planned distribution within the Washington target area of radiological detection devices?

Dr. TUVE. I do not know about the plans for it. There is not such a distribution. I believe this to be correct.

Mr. HOLIFIELD. I did not say plans, I said is there a planned distribution at this time.

Dr. TUVE. The distribution does not exist.

Mr. HOLIFIELD. The distribution does not exist. Now that applies to, I assume, your local Washington civil defense effort. It must, of necessity, be a matter of cognizance of the FCDA. Do you know whether the same condition exists in Silver Spring and in Alexandria, Va.?

Dr. TUVE. I believe that the cities or regions in the country that have such a distribution of instruments are so small that you could probably name them offhand. It is very few.

Mr. HOLIFIELD. All right, proceed.

Dr. TUVE. As a final absurdity I might point out that despite vigorous criticism, the standing orders on receipt of an alert will close down all radio stations immediately. After 15 or 30 minutes they will begin Conelrad operations, which will transmit only fragments of messages to many or most of the listeners.

Mr. BALWAN. Mr. Chairman, I ask a question at this point, if I may. This is pretty strong, and I think it might be wise to clarify this. Is there no message at all at the time of warning as to why the program is going off the air?

Dr. TUVE. I believe there is an announcement. This is what they will do.

Cut off the carrier wave for 5 seconds, return the carrier to the air for 5 seconds then cut it off again for 5 seconds. This operates the relays. They broadcast a thousand cycle note for 15 seconds.

Mr. BALWAN. These are deliberate measures that something is happening. It is not just a power failure.

Dr. TUVE. Oh, no, this is done by the operators in the station. Then they broadcast the Conelrad radio alert message:

We interrupt our normal program to cooperate in security and civil-defense measures as requested by the United States Government. This is a Conelrad radio alert. Normal broadcasting will now be discontinued for an indefinite period. Civil defense information will be broadcast in most areas at 640 and 1240 on your regular radio receiver.

Mr. HOLIFIELD. And then they are shut off for how long?

Dr. TUVE. Well, then they are shut off and it takes 15 minutes or half an hour to retune all the circuits in your transmitter and get it back on the air at the Conelrad frequencies.

Mr. HOLIFIELD. Do you believe that the majority of the people know of this procedure?

Dr. TUVE. The people in civil defense know about it.

Mr. HOLIFIELD. But I am talking about the people of the Nation who have radios. Do you know that this is going to happen, and are they aware of it and the significance of it?

Dr. TUVE. There have been too many tests and things. I don't think they know anything.

Mr. HOLIFIELD. In other words, you don't believe that the majority of them actually are well enough informed to realize the significance of this. They might think it is just another test.

Dr. TUVE. They are sure to think that is at best another test. They probably won't think anything except the radio is off.

Mr. LIPSCOMB. I think one of my daughters knows about it. It is marked on the radio, the new radio, and has a mark where one tunes in for civilian-defense frequency.

Mrs. GRIFFITHS. But do the operators in the stations know about it? Do they know that this could happen or would they recognize it right then, or would they assume that it is a false alert?

Dr. TUVE. There is no provision that I know of for a distinction between a real alert and a test, for example.

Mr. HOLIFIELD. They broadcast no instructions?

Dr. TUVE. This is what their instructions are, broadcast this and shut off.

Mr. HOLIFIELD. They do that on tests and they would do it on the real thing, just the same.

Dr. TUVE. I did not hear the last test. Did they do this?

Mr. BASCOM. That's correct, except generally they run the tests about 3 o'clock in the morning so they don't disturb the commercial broadcasting, and consequently, few people have heard it.

Mr. HOLIFIELD. I have never heard one.

Dr. TUVE. The people do not know. They are in the hands of the Government.

Mr. HOLIFIELD. I have never heard one of those breaks. Go ahead.

Dr. TUVE. The principal elements of the civil-defense situation from a social standpoint are: (1) Fixing the responsibility; that is, Federal, State, regional, local; (2) providing the legal and operational framework; and, (3) educating the public for action and to insure public confidence.

On the other hand, the principal technical matters which must be assessed and resolved, are: (1) The probabilities of various forms of attack and destruction expected—planning assumptions; (2) long-term dispersal of industry and people—this involves tax incentives, zoning, financing, roads, public utilities; (3) development of a warning system; (4) proper use of evacuation as a technique; (5) the need for many bomb shelters of moderate strength, also designed for fallout protection; (6) emergency supplies; (7) fallout survey arrangements and postattack communications; (8) civil order and police authority; and (9) recovery—we must rise up on our knees.

Mr. BALWAN. Does this imply that none of these are being done?

Dr. TUVE. They are not being done at all satisfactorily or adequately. They have been heard before, that's right.

Mr. BALWAN. Such things as emergency supplies. FCDA has an extensive and fairly expensive program. I think they have bought probably $100 million worth of medical supplies.

Dr. TUVE. As far as we have been able to ascertain in committee, there has never been a really adequate study as to what supplies should be obtained, technical study, a realistic technical study on the basis of information as to the possible results of a modern attack, as to what supplies ought to be stockpiled and where they should be distributed.

Take just such a simple matter as food. We have enormous reserves, I understand, and I believe some part of the House is concerned with surpluses in agriculture, but they are not in the right places to be valuable to the concentrations of people that might be quite hungry if they survived.

I am not aware of a technically adequate study, we would call it operational research, as to what would constitute a satisfactory allocation of the different items, followed then by a purchase program. I do know there is quite a large purchase program.

Mr. HOLIFIELD. On the medical supplies.

Dr. TUVE. I have no idea where the supplies are stored. I believe that has been not on the the basis of having supplies in the right place, but rather on the basis of where there are storage facilities?

Mr. HOLIFIELD. I was going to ask that. As I understand it, and I may be wrong on this number—well, I won't give the number. There

are a number of medical depots filled with supplies bought by the Federal Civil Defense Administration.

Are those depots arranged inside of target areas where available warehousing may be obtained, or have they been located from a strategic standpoint to be preserved, or have the best chance of preservation in case of nuclear attack?

Dr. TUVE. I do not have direct and personal information on this point.

Mr. HOLIFIELD. We will ask the Federal Civil Defense that question.

Mr. BALWAN. Has the committee studied this problem, at all?

Dr. TUVE. I wouldn't say we have studied it, no. We have asked about it.

Mr. BALWAN. There is no formal study or personal study by Mr. Bascom of this?

Dr. TUVE. We did not ask him to do that. By the way, I should like to clear up Mr. Bascom's status.

Mr. Bascom is an employee of the National Academy of Sciences and the National Research Council. He is not under contract to the Federal Civil Defense Administration.

As a committee we are responsible to see that adequate studies, technical studies, are carried out to meet the contract made by the FCDA with the President of the National Academy. But Mr. Bascom is our man.

Mr. HOLIFIELD. He is your employee?

Dr. TUVE. Right.

Mr. HOLIFIELD. And he answers to you?

Dr. TUVE. Right.

Mr. HOLIFIELD. First, and then——

Dr. TUVE. He has informally been an adviser to the Federal Civil Defense Administration. We have put no barriers, I hope, in the way of his quite free communication, and I know how free that has been.

Mr. HOLIFIELD. Would you say that the statement that Mr. Bascom made today is generally in line with the thinking of your committee?

Dr. TUVE. Very much in line with all of the thinking of our committee.

Mr. HOLIFIELD. Would you see that members of your committee receive a copy of his statement and, if there is any substantial disagreement as to the principles which he has outlined in there, would you communicate with this committee in writing and indicate the feeling of your general committee, after this testimony is made available to them?

Dr. TUVE. I shall do that.

Mr. HOLIFIELD. We do this from the standpoint of the fact that we realize you have a body of very reputable men on this committee, and we are not concerned with small matters of styling, but substance, and if there is anything that you think is important enough to add to, or to differ with, or to subtract therefrom as a committee, we would like to have you give us that information.

Dr. TUVE. I shall report back. I should also remark that they already have his statement. I don't quite know when it was mimeographed, but the first action that occurs on any of the reports made in our office at the Research Council is that the members of the advisory committee receive copies.

However, I have a considerable degree of confidence that there is support for his statement, because, essentially, it is a repetition of the many statements and positions taken in the various previous reports that we have met, discussed, and even officially transmitted to Mr. Peterson. Our last meeting was just before Christmas.

Mr. RIEHLMAN. Mr. Chairman, I would like to make this suggestion for your consideration. In view of the fact that Mr. Bascom's statement has been sent to these 12 members—are they 12 members?

Dr. TUVE. I will have to count them. Here is the list. Instead of asking his staff to do it, I think it would be very proper for your staff to write a letter to these people and say, "We understand that Mr. Bascom's statement has been presented to you and we would be very pleased to have your comments pro and con on his statement." And then you won't have any embarrassment coming through the staff or anything else.

Mr. HOLIFIELD. Isn't it that you are not on the staff?

Dr. TUVE. I am chairman of the Committee of the National Academy.

Mr. HOLIFIELD. I thought in making my request to the chairman of the committee that he would follow through on it, but I will be glad to put it in writing.

Dr. TUVE. I have already made a note for myself that I am asked to report back to you in writing if the members of our committee differ from the views presented by Mr. Bascom.

Mr. RIEHLMAN. Mr. Chairman, I would like to go just a little bit further, because I think this is a very broad subject and one that we want to get to the roots of.

I suggest that our staff write directly to these 12 members, in view of the fact that they have his report, and ask them to write to us direct, to the chairman, giving their pros and cons in respect to Mr. Bascom's statement.

Mr. HOLIFIELD. I will be glad to do that. I think it is a fair request.

Mr. RIEHLMAN. It is something that will be fair to everybody.

Dr. TUVE. Here is a verified copy of the membership of the committee.

Mr. BALWAN. Mr. Bascom read the names of the members of this committee, did you not, Mr. Bascom?

Mr. BASCOM. Yes, sir.

Dr. TUVE. The technical solutions needed for the questions raised by these physical problems do not lie in a realm of extreme difficulty. No "Manhattan District" type of organization or effort will be required, but there must result from technical studies a sound framework for civil-defense policy.

It must rest on more than politically expedient estimates of what should be done in any regional or local situations, and it must be carried out for each local situation on the basis of technical examples for typical situations. Without a demonstrably sound technical approach the proposed actions will not have the confidence of the public.

Some of us have made crude estimates of the possible overall costs of reasonable civil-defense preparations. None of these estimates ever reaches as much as 5 percent of the present budget of the Department

of Defense. In fact, adding up nearly all of the suggested activities for a period of 10 years may bring the total expenditure to something between 4 and 7 billions of dollars. In addition, of course, there may be a roughly equivalent amount represented by tax inducement and rapid amortization, but much of this latter will, after all, make for better peacetime living as well.

The technical subjects which will call for Federal expenditure might again be listed as education, warning, shelters, special roads, and public utilities in dispersal areas, cover and fallout protection, emergency reserve supplies, fallout measurement and postattack communications, decontamination, civil guard and police authority, factory reassignments and reserve tools, and finally, emergency rehabilitation of the people.

Mr. LIPSCOMB. Do you mean that this money is spent on doing these things, or is this on the study of these things?

Dr. TUVE. It will be spent on doing those things. It should not be only by Federal funds, but certainly Federal funds will be needed to carry out most of those things.

Mr. LIPSCOMB. You are suggesting it on a matching basis, then?

Dr. TUVE. I have not made any suggestion as to the mechanism for financing. I wish to speak a little later about the legal situation, division of responsibility between the Federal Government and the States, for example.

Mr. HOLIFIELD. Dr. Tuve, in going through this group of subjects, I do not find any reference to martial law. Has there been any thinking on the part of your committee or any discussion on problems which the declaration of martial law might involve?

Dr. TUVE. Very much so, and we have had the benefit of consultation, cross discussions, with Dean Cavers, of Harvard Law School; Mr. Bleickens, a member of our committee. He has been a member of the Life Insurance Association, I believe it is called—I would have to look it up in this report—a committee of the life-insurance companies who made a report a couple of years ago.

He was a member of the East River project, and he was also a member of the special committee of the National Planning Association, and I believe that most of the members of our committee would be inclined to take the position indicated in this book that was a study by the National Planning Association.

Mr. HOLIFIELD. Does that take up a study of the martial law question?

Dr. TUVE. Yes, it is not a yes or no, it isn't a black or white question.

Mr. HOLIFIELD. This committee certainly has no convictions on the point.

Dr. TUVE. I believe our committee has convictions that martial law would be a very regrettable necessity. It is likely to happen as we saw in Operation Alert.

Mr. HOLIFIELD. Was there any reason or was it just simply omission that you did not list that with your group?

Dr. TUVE. I didn't think it would cost any money.

Mr. HOLIFIELD. What do you mean?

Dr. TUVE. The technical subjects which will call for Federal expenditure.

Mr. HOLIFIELD. Oh, I see what you mean. And there are other problems.

Dr. TUVE. There are many problems. I will list 1 or 2 of them later.

Mr. HOLIFIELD. This first came to my attention through an article in a law journal.

And we intend, by the way, to check into that to get the thinking on both sides, and also to get the degree of effect which the declaration of martial law might have.

We want to know many things, including whether the whole buildup system of civilian defense will immediately become subject to a group of generals; we also want to know if there is a group of generals ready to take over that responsibility, and we will ask that of the military when they come in.

It seems to be of enough importance to a great many legal people, and I am not a lawyer, to be worthy of looking into by our committee, and at least knowing what path we are going to tread when the emergency time comes.

Dr. TUVE. I believe most people are aware that this is a Damocles sword hanging right over us.

Mr. HOLIFIELD. It may be necessary. It may be the only way we can do this job.

Dr. TUVE. If so, some preparation had better be made.

Mr. HOLIFIELD. I think the committee feels that we shouldn't go into this thing without knowing the impact of it, the reasons for it, and the scope of it.

Dr. TUVE. Correct.

Mr. HOLIFIELD. That was brought to our minds by the fact that it was part of the exercise of Operation Alert.

Dr. TUVE. That's right.

Mr. HOLIFIELD. You may proceed.

Dr. TUVE. The present sad state of civil defense needs little comment. The whole country knows of it with devastating conviction. Governor Peterson is a devoted public servant and a personally likable man, but he and his top lieutenants seem to have no conception of what should constitute an acceptable performance by their organization. The continuation of the FCDA and its State and local collaborators in their ineffective activities, gives a measure of the failure of their leadership. Furthermore, the failure of the FCDA to assess on its own, and effectively to report back to Congress and the President the unworkable division of responsibility and authority inherent in the present conception of civil defense as chiefly a matter of State and local responsibility, is another measure of their failure. A third measure is found in the total inadequacy of the technical guidance which FCDA has given to individuals and local communities.

As for constructive actions which might bring about some change in the situation in the immediate future, I might personally suggest two things immediately. First, to appoint a special commission on civil defense with broad powers and responsibility, and with a specific instruction for recommendation on the legal steps which should be taken to modify the Federal, State, and local relationships.

A good presentation of this position is given in pamphlet No. 92 of the National Planning Association.

Mr. LIPSCOMB. Why is it that you are puzzled when Congress investigates this, and yet you suggest a commission to do some study?

Dr. TUVE. Partly because of the traditional division of powers and responsibilities and because FCDA already exists in the executive branch.

Mr. LIPSCOMB. You indicate in your statement that Congress already has enough information before it so that it can go ahead and initiate action to strengthen Federal civilian defense, and yet here you suggest that we set up a commission with instructions for recommendations.

Dr. TUVE. I am not familiar with the mechanisms by which Congress as such can set up the same kind of a full-time deliberative study group as is represented by a typical Presidential commission to examine a given area.

Mr. HOLIFIELD. Let me enlighten you, if I may, on that point. I happen to have been a member of the Hoover Commission.

That is a commission that was set up twice by the Congress to do a job that Congress thought could properly be done better by an outside commission than the Congress itself in bringing more objectivity to it, and it was a mixed body of congressional people and outside people in our industry, in our different strata of society, and so that is one way; a Presidential commission is another way.

In view of the fact that this is going to require legislation, it might be well to add to your thinking the possibility of the Congress setting up a commission, although I will be frank with you, I would vote against it, because I have had enough experience on commissions to believe that Congress, in the main, is abdicating a lot of its own power when it appoints a commission such as that, although it is not obligated to follow that commission. I am going to take the position that this subcommittee might make this study just about as well as some outside people, because there are men on this subcommittee that have been dealing with the military, dealing with atomic energy, and dealing with reorganization plans and so forth, and I take the position that possibly we could do this job, by calling in people, and experts like you, and having you and men like Dr. Libby and our Chiefs of Staff and people in the highest positions throughout this Government, because this is a complicated matter, and getting their expert testimony, and then possibly from that body of expert testimony we might resolve that it was necessary to go into it deeper with a commission.

On the other hand, we might resolve that enough testimony had been given to us that we could come to certain findings and conclusions and recommendations in our regular legislative process. Does the gentleman wish to respond to that?

Dr. TUVE. Well, I will admit that my thinking has been that it is really a Presidential responsibility to clear up the situation, because the FCDA is in the executive branch.

The only effective way that I saw to do that was for the President to call on some senior industrial administrators and executives, to study the problem for the Nation as a whole and make a recommendation. It has seemed a little, let's say, faster spindle to do this with the Presidential commission than with the very large commission of a congressional commission.

Mr. HOLIFIELD. That is a point of view; I am not quarreling with that, but I am just suggesting some alternatives and some of our resolutions do call for that type of a thing, that are before the committee.

Mr. Lipscomb.

Mr. LIPSCOMB. I was just going to observe that in the cases that I seem to remember, when a commission is created where the recommendations have to go back to Congress for action, that more often than not it delays fast action.

Mr. HOLIFIELD. It is a slower process.

Mr. LIPSCOMB. It is a slower process instead of a faster process.

Mr. RIEHLMAN. What happens, Mr. Chairman, if I may comment, is that the Congress then takes a look at the commission's report and decides what it wants to do from that report, and it is a long drawn-out process.

Mr. HOLIFIELD. That is true, but the Congress is going to have to take a look at the President's commission's report, too, because it involves legislation.

They are also going to have to take a look at our recommendation because it involves legislation, so it is a slow process. I don't think we can gain anything by discussing at this time, the different methods.

Dr. TUVE. I might remark I should be very happy myself if both Congress and the President would take this very seriously.

Mr. LIPSCOMB. I can't help, Mr. Chairman, but go back to this statement about your puzzlement about Congress reinvestigating this, and whether you really meant to say just that.

Dr. TUVE. Well, I suppose that is wrong. It would be better to reinvestigate before you initiate action. It must be a technically incorrect position I have taken.

Mr. LIPSCOMB. It does not bear out that statement, in my opinion. I just hope you weren't referring to this particular investigation.

Dr. TUVE. Oh, no; I am very happy that this committee is active on this subject. This is the most encouraging thing that we have encountered for a long time.

Mr. RIEHLMAN. I am puzzled as to why you made such a statement:

I am somewhat puzzled as to why the Congress must reinvestigate the needs of our civil defense.

Dr. TUVE. I learned about, I guess, a quarter of four yesterday afternoon that copies of this were needed last night, before supper, so I got my secretary in, dictated to beat the band, got it written and delivered down here by a quarter to seven. That sentence wasn't very well considered, I think.

Mr. HOLIFIELD. I think we have all made statements when later on we look at them in cold print, we regretted the choice of some words and phrases, and I think he has adequately explained it. At least he has said that he is not alarmed at our work on the matter.

Dr. TUVE. I am very happy that this committee is examining the question.

Mr. HOLIFIELD. You may proceed.

Dr. TUVE. Second, to instruct the existing FCDA to place contracts promptly with suitable organizations for research on the technical factors involved in civil defense, with the explicit aim of providing a technical framework for civil defense policy. If long delays are encountered at the national level in resolving the civil defense

picture, such a technical framework, soundly assessed and clearly presented, with examples of its local application, will permit the State and regional authorities to proceed intelligently on their own responsibility.

You have asked for my comments as to possible legislation. I am personally not ready to accept either of the positions represented by the bills now before the House. In spite of the obvious relationship to war, and the outrageously inadequate situation we have reached in the field of civil defense, there are many good reasons against making civil defense a military activity of the Department of Defense.

If it could be by way of a civil activity in the Department of Defense, that might be another question that I haven't considered.

Mr. BALWAN. I think that that was the sense of the bill.

Dr. TUVE. I didn't quite realize or picture that this was possible. I may not have used enough imagination.

One of the difficulties, of course, is the matter of competition for funds in the overall defense budget. Another, and perhaps more serious one, is the competition in the Department of Defense for precedence and emphasis among various activities.

Mr. BALWAN. At that point, may I interrupt, Mr. Chairman, because the next point goes on to the Cabinet level, outside of the Department of Defense.

Your objections are not one of intrinsic merit, but mostly of expediency. In other words, it does not seem like they can get the money and there is going to be too much squabbling between the four secretaries, is that it?

Dr. TUVE. Well, this is only part of it. These are examples of the kinds of technical problem involved in deciding where a given activity needs to go in the complex structure of our Government.

I later say that I think this should be studied, and certainly, I cannot pretend competence in advising on such a technical point.

On the other hand, I feel that it could be a dangerously empty gesture to create a new Cabinet post for civil defense. It takes long years to build up an effective and functioning staff in a new Government department. I fail to see how Governor Peterson would have been in a very much better position if he had functioned as a Cabinet member with his new organization. However, decision as to legislation will surely be best made after study of the problem, for 6 months by a congressional or Presidential Commission.

Mr. HOLIFIELD. You did include a congressional commission.

Dr. TUVE. I did. Sir, I would like to add 1 or 2 paragraphs, selected paragraphs from a letter that I wrote, if I may, to complete the point here.

Mr. HOLIFIELD. Yes, sir, and we will include your full letter, sir, at this point in the record, as long as you are quoting from it.

(The letter above referred to is as follows:)

NATIONAL ACADEMY OF SCIENCES, NATIONAL RESEARCH COUNCIL,
ADVISORY COMMITTEE ON CIVIL DEFENSE,
Washington 25, D. C., January 17, 1956.

Congressman CHET HOLIFIELD,
House of Representatives,
Washington, D. C.

DEAR CONGRESSMAN HOLIFIELD: Thanks for your letter of December 19th regarding the study which your subcommittee has undertaken; I have every hope that the outcome will be useful and constructive. An outline of my views on the defects in civil defense and the best way to overcome them follows:

The situation presented by nuclear warfare is not hopeless. A technically and socially adequate civil defense can convert an otherwise obliterating catastrophe to a situation in which, despite grave damage and losses, remains afterward an intact, workable, and purposeful society.

The greatest barrier to a satisfactory civil defense is the attitude of the Federal Government that civil defense is a State and local problem. It should not be necessary to repeat here the familiar argument which has been so magnificently ignored, that an attack on any city is an attack on the United States as a whole—and as such should be defended by the whole United States, i. e. the Federal Government. Surely by this time the multimegaton nuclear weapon has settled that point (the direct effects of a single burst may cause serious damage in a 1,500 square mile area). If any doubt remains, the fact that potent radioactive fallout may cover thousands of additional square miles should be the clincher. Thus any of the possible attacks that we visualize are literally against the United States as a whole. Defensive measures must take no more heed of our internal political boundaries than these weapons effects.

This does not mean that the Federal Government can be expected to do everything but it must provide real leadership in planning; it must supply substantial funds and tax benefits to carry out and/or make feasible its plans; it must exercise emergency controls over both attacked and nonattacked areas in order to make the most efficient use of the national resources; it must arrange for the use of its manpower before, during, and after an attack (including the use of the Armed Forces and their reserves when necessary) and it must conduct an educational program on an unprecedented scale.

These are not luxuries which the Executive and the Congress have a right to withhold—for one of their clearly stated duties is "to provide for the common defense." There is an imperative need for a new set of people with carte blanche to make plans under a new set of orders in a new and more advantageous position in the Government.

The Federal Government badly needs a policy and a plan based on long-range planning assumptions. It is evident that plans made at the local level on a year-to-year basis, following the gradually changing FCDA assumptions, will never overtake the threat. For example, the incipient existence of intercontinental ballistics missiles (in 4 to 10 years) makes it imperative that measures be started at once which will have some capability of countering that threat when it arrives. At the very least a national system for warning the public in a few minutes will be needed; provision must be made for the development or construction of shelters that can be reached in a few moments; and a national plan for preattack living and working dispersal of people, facilities, and industry must be prepared and implemented. These things cannot be done at the last minute or in a single year; they must be part of a continuing program to develop a defensive capability hand-in-hand with the development of all other phases of the national growth.

The ultimate responsibility for each individual lies with the individual himself (or the family); people must take action to protect themselves. However in most cases they must be educated in advance and provided with (or stimulated to provide for themselves) protective facilities. The last 5 years have adequately demonstrated that except in rare circumstances local areas have not made adequate provision for their own defense. In a large measure this is because they are waiting to be led. When they look to Washington for leadership they see a confused picture in which the very people who maintain that civil defense is a local problem have not provided a local civil defense in their own city—Washington, D. C. The fact that there is no workable program right now for the Capital City as a whole or for the Congress or for much of the executive branch has been widely publicized. With the National Government setting that sort of an example what can you expect at the local level?

The most important need of all is for what we might call a technical framework—solid planning information about the threat, weapons effects, and countermeasures. It should establish the best procedures to be followed with respect to warning, dispersal, shelters, education, evacuation, communication, fires, use of manpower, etc. Over 6 months ago our committee recommended to FCDA an extensive program of systems analysis (copy of which is attached) which, had it been followed, would have made considerable progress in this direction. It called for the use of research contractors with technically competent and unbiased staffs to conduct operations research aimed at the formulation of an optimum program. Only a small part of our suggestions have been followed.

I regard the present national civil defense effort as a failure. In fact it seems to have been so fumbling and inconsistent as to have lost public confidence and made a difficult situation more difficult. If necessary, however, relatively few high-caliber men, ably led, could operate effectively even under the present legislative limitations and start lifting a revamped agency by its own bootstraps. (Simply changing the position of the present group in the executive branch or enlarging the budget as have been repeatedly suggested, cannot be expected to to produce an effective civil defense.) I hope it is not necessary to settle for so modest a goal but as a minimum effort such a new group could at least establish the outlines of a technical framework on which local plans can be based if substantial Federal action is not forthcoming.

Some sweeping measures must be taken at the highest level which will give the whole program a fresh start. A new name, new law, new budget, new (and competent) people, and a position of respect in the executive branch are needed. All nonmilitary defense functions need to be consolidated in one agency. Laws need to be enacted by means of which firm action can be taken without regard to local political boundaries in planning and preparation as well as during an emergency itself.

Civil defense is by nature a hybrid, making use of military measures adapted for civilian use, and therefore may not seem natural to either military men or civilians. We must have a special set of standards against which we can measure the adequacy, authority, and budget of the civil defense program; these standards must be related to necessity, not to convenience.

I will be glad to amplify these remarks before your committee or to assist in any way possible with the study of civil-defense problems.

Yours very truly,

MERLE A. TUVE, *Chairman.*

Dr. Tuve (reading):

The greatest barrier to a satisfactory civil defense is the attitude of the Federal Government that civil defense is a State and local problem.

These I should say, are my opinions. I fear I neglected to write that specifically in the letter, that I did not get this letter approved by a committee meeting. It was sent immediately to all members of the committee, and I have had no objections.

Mr. HOLIFIELD. Will you just read your whole letter, Doctor, at this point? It is not too long, is it?

Dr. TUVE. The emphasis is a little different if I read it in this abbreviated fashion. I am happy to have it incorporated.

The greatest barrier to a satisfactory civil defense is the attitude of the Federal Government that civil defense is a State and local problem. It should not be necessary to repeat here the familiar argument which has been so magnificently ignored, that an attack on any city is an attack on the United States as a whole—and as such should be defended by the whole United States, namely, the Federal Government. Surely by this time the multimegaton nuclear weapon has settled that point—the direct effects of a single burst may cause serious damage in an area of 1,500 square miles. If any doubt remains, the fact that potent radioactive fallout may cover thousands of additional square miles should be the clincher. Thus any of the possible attacks that we visualize are literally against the United States as a whole. Defensive measures must take no more heed of our internal political boundaries than these weapons effects.

This does not mean that the Federal Government can be expected to do everything but it must provide real leadership in planning; it must supply substantial funds and tax benefits to carry out and/or make feasible its plans; it must exercise emergency controls over both attacked and nonattacked areas in order to make the most efficient use of the national resources; it must arrange for the use of its manpower before, during, and after an attack—including the use of the Armed Forces and their reserves when necessary—and it must conduct an educational program on an unprecedented scale.

* * * * * * *

At the very least a national system for warning the public in a few minutes will be needed; provision must be made for the development or construction of shelters that can be reached in a few moments; provision must be made for postattack

communications and fallout surveys, and a national plan for preattack living and working dispersal of people, facilities and industry must be prepared and implemented. These things cannot be done at the last minute or in a single year; they must be part of a continuing program to develop a defensive capability hand in hand with the development of all other phases of the national growth.

* * * * * * *

The most important need of all—

I spoke above of the barriers—

is for what we might call a technical framework—solid planning information about the threat, weapons effects, and countermeasures. It should establish the best procedures to be followed with respect to warning, dispersal, shelters, education, evacuation, communication, fires, use of manpower, et cetera. Over 6 months ago our committee recommended to FCDA an extensive program of systems analysis—copy of which is attached—which, had it been followed, would have made considerable progress in this direction. It called for the use of research contractors with technically competent and unbiased staffs to conduct operations research aimed at the formulation of an optimum program. Only a small part of our suggestions have been followed.

As a minimum effort, a new group could at least establish the outlines of a technical framework on which local plans can be based if substantial Federal action is not forthcoming. Some sweeping measures must be taken at the highest level which will give the whole program a fresh start. All nonmilitary defense functions need to be consolidated in one agency. Laws need to be enacted by means of which firm action can be taken without regard to local political boundaries in planning and preparation as well as during an emergency itself.

The situation presented by nuclear warfare is not hopeless. A technically and socially adequate civil defense can convert an otherwise obliterating catastrophe to a situation in which, despite grave damage and losses, remains afterward an intact, workable, and purposeful society.

Mr. HOLIFIELD. Does that conclude your formal statement?

Dr. TUVE. That concludes my formal statement.

Mr. HOLIFIELD. Thank you very much, Dr. Tuve.

Are there some questions by members?

Mr. LIPSCOMB. I would like to discuss the criticism that he has made of Governor Peterson and discuss the statement that was made that he or his top lieutenants have no conception of what should constitute an acceptable performance by their organization.

You feel that he has no conception, or does it just not come up to your expectation?

Dr. TUVE. I have said what I mean. He seems to have no conception of what would constitute an acceptable performance by his organization.

Mr. LIPSCOMB. Do you feel that under the present laws, the framework of the present laws and the present appropriations civil defense has received, that someone else could do it different?

Dr. TUVE. It would be a difficult task under the present legislation. It probably could be done in a sudden emergency. It would be far better to revise the framework in which the civil-defense people have to work.

Mr. LIPSCOMB. In my city of Los Angeles, I do not say they have an adequate or complete program, but I know they are working out there, and something is being done.

Dr. TUVE. Right.

Mr. LIPSCOMB. Somebody has some conception of civilian defense, and they must have a leader some place.

Dr. TUVE. I am not talking about some conception of civil defense. I am talking about what should constitute an acceptable perform-

ance in leadership, in technical guidance, as well as actual operations in civilian defense.

Now, I have pointed out that I don't know how you can get the right kind of a coherent group of workers under the present split responsibility. This is a basic flaw, in my opinion, with which if I were in Governor Peterson's shoes, my biggest effort would be to report back that this is not a suitable position from which to lead the Nation in civil defense.

Mr. LIPSCOMB. How can you make the statement that he has no conception of this?

Dr. TUVE. I simply made the statement.

Mr. LIPSCOMB. You must have some background. You must know that he has not gone to the President or to others in high office and explained to them this very inadequate——

Dr. TUVE. You will notice that I made the statement about only partly Governor Peterson, but also his lieutenants. I think that the day has been spent indicating to you the basis on which I have gradually arrived at this feeling.

Mr. LIPSCOMB. You say the law is not adequate nor does it even give him the authority that you think he should have, that the appropriations are very meager compared to what you think he should have.

Dr. TUVE. No; I haven't actually criticized the appropriations today.

Mr. LIPSCOMB. I am comparing this, your statement of $7 billion against the $123 million asked for this year. And every year Congress has cut their budget. They have brought in a program which Congress could not agree with. Back in 1951 they asked for $403 million.

Dr. TUVE. Right.

Mr. LIPSCOMB. And they got $33 million.

Dr. TUVE. Right.

Mr. LIPSCOMB. In 1953 they asked for $600 million and they only got $43 million.

Dr. TUVE. I am convinced they would have had a much larger fraction of these requests appropriated if technical studies of the type that we have suggested here had been adequately carried out.

I am also convinced that they might have been much better able to carry out those studies if the position of the administration—I don't quite know how to put this—if the Government here in Washington, took the position which I recommended, namely, that this is a national responsibility, not a State and local responsibility. This is the basic flaw and you gentlemen are exactly in the right position to see it.

Mr. LIPSCOMB. Do you know how Governor Peterson feels about this and his top lieutenants, as you put it?

Dr. TUVE. I think he feels frustrated. I salute his courage in going forward.

Mr. LIPSCOMB. In other words, you feel he has a conception of the thing but is frustrated because he can't get anything done?

Dr. TUVE. Yes. I would say I am still not satisfied that he should accept the kind of performance that is carried out in his organization, but this applies much more generally than to Peterson alone.

Mr. LIPSCOMB. But he should do the best job possible under the present framework of the law and make recommendations to go further?

Dr. TUVE. Right.

Mr. LIPSCOMB. Just because he is doing the job working under the present framework of the law does not indicate to me that he has no conception of his responsibility.

Dr. TUVE. I am not agreeing with your statement.

Mr. LIPSCOMB. You must know something. I mean, you must know that he hasn't performed.

Dr. TUVE. I think the day has been spent laying before you the technical shortcomings of civil defense in the United States today. Mr. Peterson is in charge of it. I don't blame Governor Peterson for all of these shortcomings, but they are there.

Mr. LIPSCOMB. They don't have all the legislation necessary to do all the things that you want to do.

Dr. TUVE. That's right.

Mr. LIPSCOMB. Congress has to pass the legislation.

Dr. TUVE. That's right.

Mr. HOLIFIELD. I think we ought to clear the record here if my colleague will yield.

The Civil Defense Act under which Governor Peterson is operating was passed in 1950. Prior to Mr. Peterson's occupancy of the position as Director, Gov. Millard Caldwell, of Florida, an appointee of the previous administration——

Dr. TUVE. I knew him, too.

Mr. HOLIFIELD. Was the Director. Notwithstanding the fact that during that period of 5 years the impact of weapons increased tremendously, neither Governor Caldwell nor Governor Peterson, as far as I know, have come to the Congress, as is the duty of the heads of all departments of Government, and requested a change in the legislation.

And that is one of the reasons—and I condemn with equal fervor the lack of action on the part of Governor Caldwell of Florida, of the former administration, and Governor Peterson. If we are in the position where he needs more authority, and I think we are, and we are going to give it to him even though he does not ask for it, if we can do it, we are going to put this on the basis of putting enough authority there and changing the legislation so he will have better tools to work with.

But I point out for the record that neither one of these directors has come to the Congress and asked for legislation. I am hoping the result of this hearing is that they will get busy and draft some.

I have a whole stack of amendments here sent down from the Harvard Law School from a Mr. Charles Fairman, a group of amendments which he has sent down to this committee, because of his interest in this study of it. I have had no such, as far as I know, and no other committee has had, such drafts of legislation sent up by the Director of Federal Civil Defense Administration.

Dr. TUVE. I made this point in my presentation, if I might remark, and my comment about Governor Peterson principally and his lieutenants, Mr. Lipscomb, refers to these technical studies which are still sorely needed for the guidance of local people.

The local and regional authorities still have the responsibility to go ahead and do what they can. I must say that many of them have been making a brave struggle to do something intelligent.

Mr. HOLIFIELD. Could they have made these studies with the budgets that have been provided?

Dr. TUVE. I believe so, if they had been properly spent. At present there are many millions of dollars suddenly being invested in so-called survival studies in about 10 cities. This is why I have called for two things.

One was a commission to see how the legal framework and the area of responsibility, division of responsibility, should be modified.

But I also called for action by the President, which I still believe would be very healthy, to direct the Administrator to carry out promptly with suitable organizations research on the technical factors involved in civil defnse. This research program which called for something of the order of $4 million is the crying necessity.

If you can give people a technical framework so that they can answer John Smith as to what he really ought to do with his family, and answer each industrialist as to what he ought to do with his establishment, the technical framework on which he can hang civil defense local policy, then there are many people in this country who will take action.

And again the technical items calling for an operational analysis or examination, and then specific recommendations for action. The ones that I listed are warning systems, protective action, what we call reduction of urban vulnerability, radiological defense, the action by support area, civil defense communications system, bomb-damage assessment, and so on.

I might also say that one of the principal things needed in the FCDA is simply to take a position, for example, on warning. It is not a highly technical problem. There are any number of ways by which the people can be given direct warning.

But someone must make a decision that they select this system and put it into effect. To date there have been no decisions made for the country as a whole.

Mr. HOLIFIELD. Dr. Tuve, you used the name of Gerhard Bleicken.

Dr. TUVE. That's right.

Mr. HOLIFIELD. And he, I notice, is listed here on——

Dr. TUVE. I believe he has written the committee a letter. He is a member of our committee.

Mr. HOLIFIELD. Yes; which I might say is a remarkably interesting letter. And on this subject of research on this letter, which is under date of January 25, he says:

> The great reason for recommending this research program was that we do not know what the facts are in many of these areas. We do not know the best way to warn the people in either cities or in rurals areas. We do not know if evacuation is the best policy, particularly in large seacoast cities, and also when it is remembered that the intercontinental ballistic missile will be with us in the relatively near future.
>
> Are we wasting our time in training for an event that we could not properly execute today, and would be worthless in the era of intercontinental ballistic missiles. Our knowledge of radiological defense is small. We need better means of prediction and better means of instrumentation. Do we know the best methods of developing long-range reduction of urban vulnerability?
>
> All of the questions properly raised on our warning systems can be raised again on our communications. So, too, we need basic research on bomb-damage assessment and on human relations under mass attack and on the problems of mass fire.

And I might say that one of the great problems is the fire storm that follows these explosions, as anyone who has witnessed them knows.

Dr. TUVE. For about a year and a half we have made every effort to know how to see that an adequate technical examination and statement—some decisions are necessary and they have to be backed up technically to be made on these points.

Mr. HOLIFIELD. This man, I might say, is the president of the John Hancock——

Dr. TUVE. He is the secretary of the John Hancock Life Insurance Co.

Mr. HOLIFIELD. And they are interested, I suppose, from a business standpoint.

Dr. TUVE. The best investment that the United States can make today would be to spend that $4 million in a hurry to get this technical framework for civil-defense policy nailed down in a book that every State administrator and every city administrator and every regional administrator of civil defense could use as a manual for approved actions.

Mr. HOLIFIELD. These are only part of the letters from the governors of our States, the mayors of our principal cities in the States, and almost without exception they all say that the job is not being done that should be done, "and we don't know how to do it, and we are looking for advice to Washington."

The recent report of this Commission on Intergovernmental Relation, of which Governor Peterson was a member, also came out with a recommendation on this one point, that there needs to be a greater Federal responsibility in this field, although they advocate a decentralization in most other areas of our society.

So I think Governor Peterson is aware of the fact because by signing that report he has, to a certain extent, taken the position that this is a matter of greater Federal responsibility, and I admire him for having the courage to take that position.

Dr. TUVE. Yes, but he has not followed through with that in his organization. He has not seen to it that Mr. Aitken made the funds available and saw that the contracts were negotiated with the proper people.

We were busy helping them negotiate with Johns Hopkins University when we were notified in about May that someone else—Mr. Aitken had been down and talked with the Johns Hopkins group, but then much later, several months later when things were in a critical state, we suddenly discovered that the entire job of radiological defense around which the contract was to be built had been assigned to Health, Education, and Welfare. Well, this will knock the props out of any negotiations for a contract, and it did.

Mr. HOLIFIELD. You feel there is too much delegation in view of the fact that there are, I believe, six agencies of Government to which Governor Peterson has delegated funds?

Dr. TUVE. I don't mind if they work in parallel, but he doesn't see to it that in addition something quite definitive and specific is done under his own hand. And Mr. Aitken has not helped him see that that happens. At least it has not happened.

Mr. HOLIFIELD. Are there any further questions of Mr. Bascom or Dr. Tuve? If not, the committee will stand adjourned until tomorrow morning, and we will have as our witness Dr. James Killian, president of the Massachusetts Institute of Technology and chairman of the Killian committee.

Gentlemen, before the committee adjourns, I wish to thank you for spending the day with us, and for your testimony. I ask you again to supply the information that has been requested, and the chairman will write letters to the members of your staff in regard to the matter that was under discussion.

(Whereupon, at 4:35 p. m., the hearing was recessed, to reconvene on Thursday, February 9, 1956, at 10 a. m.)

CIVIL DEFENSE FOR NATIONAL SURVIVAL

THURSDAY, FEBRUARY 9, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS OF THE
COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met, pursuant to call, at 10 a. m., in room 1501, New House Office Building, Hon. Chet Holifield (chairman of the subcommittee) presiding.

Members present: Representatives Holifield, Kilgore, Griffiths, McCormack, and Lipscomb.

Also present: Michael P. Balwan, staff director; Earl Morgan, staff member; and Carey Brewer, Legislative Reference Service, Library of Congress.

Mr. HOLIFIELD. The subcommittee will be in order. On February 2, we directed a letter to our witness of this morning in which we asked him to appear because of his background, very splendid background. We are honored to have before us this morning one of America's most distinguished citizens, Dr. James R. Killian, Jr., president of the Massachusetts Institute of Technology. He has not only served in that high position, but he served on a number of special committees appointed to study technical phases of the national-defense program, and one of his recent assignments was the one that placed him in charge of a special committee commonly known as the Killian Committee of the President's Scientific Advisory Committee.

On February 2 we addressed a letter to Dr. Killian, following certain other correspondence in which we made this request:

> The first phase of our civil-defense hearings has been designed to develop the record on such matters as the dangers of radioactive fallout which would result from a possible enemy attack, what can be done to minimize those dangers, and how the military and civil phases of our defense program might best be coordinated to counter a possible enemy attack.
>
> By the time you appear, various witnesses will have addressed themselves to specific areas of the broad problem, and it is hoped that you will then discuss what you consider the most significant considerations affecting the entire problem of devising and maintaining an effective defense against a possible enemy attack, including an appraisal of the relative worth of civil-defense measures.
>
> The subcommittee members would appreciate hearing your views on the basic soundness of having a civil-defense program at all. You might then discuss in the light of your vast experiences with technical developments in military weapons systems, the broad implications of these developments on the organization of a national program of civil defense.
>
> While it is not our desire to call you in to testify critically on the organization of the present Federal Civil Defense Administration, it would be helpful to have your views on the general requirements for an effective program.
>
> Some of the comments which you gave before the Boston Civil Defense Conference might well be repeated and, if desirable, elaborated on. I know the members will be interested in them.

Also, your association with the Army Scientific Advisory Panel as well as membership on the President's Scientific Advisory Committee, under the chairmanship of Dr. Du Bridge, make you especially equipped, in our estimation, to discuss with the members any problems facing these organizations which you believe bear on civil defense significantly.

Finally, the members would appreciate any comments or discussion on the two civil-defense bills which the subcommittee has before it for consideration. You will note that these do not purport to revise the organic law under which the present civil-defense program operates. They do intend to provide a focal point for discussion of two approaches to a single problem, namely, that of placing the civil-defense function in a more effective position in the Federal hierarchy of organizations.

I understand, Dr. Killian, that you have a prepared statement and at this time we will be glad to hear from you, sir.

STATEMENT OF DR. JAMES R. KILLIAN, JR., PRESIDENT, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Dr. KILLIAN. Thank you, Mr. Chairman. If I may, then, I will proceed with my statement.

In presenting my views to the committee, I wish to make clear that I am not an expert in nonmilitary defense and that I have not had an opportunity to study our civilian-defense policy and program with any degree of thoroughness.

I therefore speak as a layman and private citizen and unofficially with respect to any program or agency or plan. My views in regard to specific aspects of civilian defense rest in part upon the views of a number of people whose expertness in this field is greater than mine.

Let me first emphasize my feeling that the economic and military strength of the United States depends increasingly upon that combination of science, engineering, and industry which we call technology.

In a frightening degree the deterrence of total war and the integrity and strength of the free world depend upon America's capacity to maintain a position of great relative technological strength in both the economic and military measures and countermeasures of the cold war.

Basic, therefore, to the maintenance of great strength in both the military and nonmilitary aspects of our defense is our need for a broadly conceived strategy for maintaining the United States technological supremacy. By a process of public discussion and of acquainting the public with the importance of technology we can help to augment our progress in this field.

Most basic is the need for attracting into science and engineering more first-rate young people. For the first time the United States is facing a critical limitation on its professional manpower resources as well as material resources.

Mr. MCCORMACK. May I say in this that you are an expert in this field.

Dr. KILLIAN. I know something of this problem, yes. May I say, affecting our national-defense program at this time, this shortage of scientists and engineers, there may not be enough good scientists and engineers to carry out well all the technological tasks we have set for ourselves within the time scale we have set. The requirements for maintaining an expanding economy along with creating highly com-

plex and advanced weapons systems have created this unprecedented demand for scientists and engineers.

This is but one of the many factors that we need to recognize as fundamental to the maintenance of technological superiority. We have not yet solved the problem of securing adequate funds for basic research as contrasted to applied research and development.

There may be fields of basic and applied research, such as that relating to materials, that is, to the design of new materials which need greater emphasis.

In our system is there now too much loss of time between discovery and application?

Through the recognition and management of such factors as I have mentioned, as well as many others, we must achieve a grant plan, not by centralized control or planning as do the Soviets, but by consensus, a consensus which will give direction and velocity to our technological advance.

Such a consensus seems to me to be basic to any consideration of ways to maintain and increase our defensive strength, both military and nonmilitary.

We need such a comprehensive mobilization of our technological resources in order to assure the continued maintenance of a sound mobilized base, a high degree of readiness, a vigorous research and development aimed at superiority of weapons at all times, and a strong civil defense—all essential elements in the defense program the Nation must have today.

And now, having expressed my views in regard to the importance of maintaining our technological superiority and of keeping ourselves alert and our powder dry, I wish to suggest some of the ways in which technological development inevitably affects the methods and policies of our civil-defense program.

I would like to emphasize first of all the importance of a sound civil-defense program as a means of maintaining a maximum freedom of action on the part of the United States in deterring war. And this is in answer to one of the major questions in your letter.

We must have the strongest possible military means to deter war, but our position is weakened in my judgment if we do not have in association with this a carefully and firmly planned and managed civil-defense system which will insure the maximum opportunity of survival in the event that the United States should ever be attacked.

The concept of civil defense being itself an effective deterrent is of great importance.

In this sense the basic objective of our civil-defense program should be to insure the likelihood that those cities and communities subject to an atomic attack in the event of war could survive to reorganize their life and thus to make it more difficult for any kind of sneak attack to be conclusive.

While our main deterrent to war and to an attack against the United States is our capacity to inflict terrible damage on the enemy, this deterrent needs to be augmented and accompanied by the deterrent strength of an adequate defense against atomic attack and an adequate civil defense to reduce the damage of an atomic attack should it come.

It seems to me that these are all parts of a coherent policy of building deterrent strength.

A second consideration arising from the changing technology of weapons and that is the need to adapt our civil defense to the new weapons and conditions of attack to which we might be subjected.

I cite as an example the need for an improved warning and communication system to pass a warning signal to the people. The well-publicized information that we now have substantially larger weapons and that under certain conditions these weapons produce radioactive fallout that can endanger large areas has a great impact on the whole method and policy of protecting our cities.

This change imposed by weapons developments points up the very great importance of adequate research and investigation on the best methods of accomplishing the protection our cities should have.

While I recognize full well that the general advisability of research has been accepted and is well understood, and that larger funds are now available for search programs, I also gather that the actual process of our carrying through this research to conclusive, useful results is still on the list of unfinished business.

I urge the vital importance of our Government's carrying through to completion those analyses and studies which will throw light on the casualties to be expected from various kinds of thermonuclear attacks and on the various conditions of evacuation and shelter.

I urge that survival studies now planned for major cities be carried through with urgency and dispatch, and I would adhere with the greatest possible defense we can mobilize. These studies should not be superficial.

Mr. BALWAN. Does that mean there is a chance that they may be carried out the way they are?

Dr. KILLIAN. I frankly don't know how they are organized now. But I would like to make the point that in their organization they ought to draw on the best talents we have so we really get first-rate consideration of these problems. I am not informed about the present personnel or how they are going about organizing these studies.

If such studies are to be really effective and conclusive, they should be made by groups that have had available all the necessary classified data.

It next seems urgently important to bring to fruition or to complete those studies and plans which will enable us to feel sure that our national civil defense policy is designed to cope adequately with the threat created by thermonuclear weapons and the radioactive fallout from surface bursts.

These new sources of information data and plans can greatly affect our whole evacuation program and may place a wholly new emphasis on shelters, particularly shelters against peripheral blast damage or against the fallout. It could provide the basis for a sound national policy on shelters, although we need an interim policy pending the outcome of these studies. It may place a wholly new emphasis on the techniques for reducing the lethality of fallout and provide the basis for a good radiological defense plan.

In the judgment of some people who have examined the problem thoughtfully, it may be entirely possible for suggestions to be made for the alteration of local building codes for new construction—these changes to recognize the possibility of achieving more blast protection in certain peripheral areas of an explosion, even in residential construction.

Russia apparently and other European countries have been more advanced than we in taking civil-defense action of this kind.

Again, we should also clearly recognize that the above kinds of studies are essential if we are to adapt our evacuation and shelter policies to the special requirements imposed by different cities, particularly requirements arising out of location and pattern and size.

Such studies would give us a still better basis for planning and carrying through necessary long-term policies in regard to dispersion.

Finally, as a part of a coherent civil-defense program, we need to make sure that we have the instruments and the methods of detection of radiological contamination and that adequate methods and instruments are available to civil-defense agents.

All of these considerations and factors point up the importance of research and analysis so that we may make policies and programs based on facts and not on suppositions.

While I appreciate full well the difficulties of initiating and carrying through research in this field, I nevertheless stress and urge the importance of increased research and analysis in our civilian-defense program.

Not only must we have the research and carry it through to the point where it yields results of value but we must have the mechanism for carrying these results through to positive decisions translatable to action.

In summary I come back to my basic point that advancing technology imposes new requirements and conditions on all aspects of our defense—including civil defense, that changing weapons technology augmented the need for a coherent civilian-defense program, and that such a coherent program can be a part of our total effort to deter war.

Mr. HOLIFIELD. Thank you very much, Dr. Killian. At this time would you be willing to be questioned by members of our subcommittee?

Dr. KILLIAN. I will be very glad to try to answer. I am not sure that I can in all cases.

Mr. HOLIFIELD. We know from previous appearances before our committee when we were studying research and development that you are a very modest man, but we also know that if asked questions you will answer them frankly. We have found that out in the past.

Dr. KILLIAN. May I say the study this committee made on research and development I thought was a classic and it has had a very profound effect in this field.

Mr. HOLIFIELD. That is indeed high praise, sir, for this subcommittees' work, coming from you and we appreciate having that on the record.

Congressman Kilgore, would you have any questions?

Mr. KILGORE. I would like to yield to the distinguished Majority Leader McCormack.

Mr. MCCORMACK. I will wait. Go ahead.

Mr. KILGORE. Doctor, from your statement and some testimony that has been developed here before, I get the impression that it is your opinion that the matter of an adequate civil defense contributes at least in part to the deterrent effect to be had on the enemy.

Dr. KILLIAN. Yes, I do. If the enemy felt that a sudden surprise attack could completely disorganize our total national life this would be an important factor in his consideration of whether to try such

a thing. If he feels on the other hand that we have really organized to meet such an attack and he could not completely upset our civilian life that this would be an important deterrent factor.

Mr. KILGORE. I assume that it would be somewhat presumptuous of us to attempt to evaluate by way of comparison the extent to which we ought to divide our resources as between civil defense and military defense and the capacity to maintain a strong offense, but I assume that you would rank the matter of civil defense as in addition to the humane aspects of it a sufficient deterrent so it should be evaluated in that light as well as for the protection of the population.

Dr. KILLIAN. That's right. I would certainly put our offensive military power as top priority in the total picture and defensive military power next, although offense and defense are largely unfavorable, I think civil defense comes in a third category, but a necessary one.

Mr. KILGORE. That fundamentally was what I was very much interested in. That is the only question I had.

Mr. HOLIFIELD. Mr. Lipscomb?

Mr. LIPSCOMB. Dr. Killian, as always your statement is very much appreciated by all of us. It is right to the point also and gives us a lot of things to think about.

I would like to go to your basic point here, the need for attracting into science and engineering more first-rate young people. Have you any suggestions to make on how we can attract these people into this field, what we can offer to them to put their ability into it?

Dr. KILLIAN. I think we need a whole range of moves and efforts in this country to accomplish this purpose. The problem cannot be solved by any single move that I have heard anyone suggest.

First of all we need to make clear to the public what the problem is, what the need is, and I think this process is going on at the present time. There has been an extraordinary degree of discussion and an awakening to the importance of technology to the strength of our country.

This is basic and this is one of the reasons I wanted to emphasize this point here. Let me cite just an example of what can take place. I was down in Texas recently, it was a year ago, and talked about this problem, and a young lady came up to me and said after I talked, "I want to tell you about the Texas for Teachers Organization that has been established here in Dallas."

I said, "What does this do?" She said, "Our function is to get teachers of science for the Dallas high schools." Later I got a letter from a man from Austin who said he wanted to tell me about the Grassroots Educational League in Texas. It had on its letterhead something to this effect: "For the purpose of finding teachers of science for the Texas schools." When you begin to get this kind of grassroots action, I think you begin to build up real power to do something about this kind of problem. Certainly one of the basic problems is to get more effective teaching of science in our secondary schools. We must begin to identify these young people who have special competence in this field to give them the encouragement to go on.

One of the startling facts in our total educational picture today is that so many of the top talent, high-school graduates of the country are not going on to get college degrees. One striking figure is that

one-third of the top 2 percent intellectually of our high-school graduates is not getting college degrees at the present time. This is where the big loss is coming. This is where we need to make our major effort to get a larger talent pool from which all the professions can draw, including science.

I would like to see greater efforts made to increase the motivation for young people to move into professional work.

Mr. LIPSCOMB. Are the same people who come out of universities who are qualified to teach science the same ones as those qualified to go on to applied science and basic research.

Dr. KILLIAN. Not always. Those who are qualified for teaching may not always be the same ones who are qualified for research.

Mr. LIPSCOMB. There also has to be some strengthening of the curricula too of the secondary level I imagine.

Dr. KILLIAN. I believe so. This comes about by having better teachers of science and making sure that mathematics, physics, and chemistry are taught more generally in the high schools.

Mr. LIPSCOMB. We are faced with a double-barreled problem.

Dr. KILLIAN. We are. This is a tough one.

Mr. BALWAN. We have a problem in research and development and the critical shortage of scientists, however, that problem probably ought to be placed in the context of urgency of just where we stand today. Is the situation so critical as against where the Russians stand in the production of scientists out of their secondary schools and colleges that we really have to do something in a hurry or is it something we can solve in the next 10 or 20 years?

Dr. KILLIAN. Let me——

Mr. BALWAN. Something serious will happen if we take our time or must we have a crash program?

Dr. KILLIAN. I don't think we ought to get into an academic numbers race with the Russians. Our great strength lies in the fact that we have been developing a generalized basic fundamental program in this country.

Mr. BALWAN. Isn't that the tendency when they match the numbers and throw out the numbers that the Russians are putting out a certain number of scientists against ours a year and project that rate to 1960 and say at 1960 the Russians will be here at this position and we will be here.

Dr. KILLIAN. I feel this very strongly. We ought to look at the quality of our output not at the numbers, although the numbers are important. Numbers alone will not answer the problem.

Mr. MCCORMACK. Suppose the numbers are being produced in the Soviet Union as well as the quality and we are not producing the numbers, what then?

Dr. KILLIAN. I think that we have the capacity to produce the numbers because if we make the problem known——

Mr. MCCORMACK. Yes. My understanding is that the quality produced over there is pretty high from what I have read from eminent men.

Dr. KILLIAN. Certainly the evidence indicates that their best people are very good.

Mr. MCCORMACK. I didn't mean to interrupt you, Mr. Balwan.

Dr. KILLIAN. We have a study underway in my institution, under a special grant that is attempting to evaluate the quality of the Russian

technical education and the results are not all in on this. But I think we have to assume that it is good.

Mr. BALWAN. Dr. Killian.

Mr. HOLIFIELD. Will you yield on that point?

Mr. LIPSCOMB. Yes.

Mr. HOLIFIELD. The end result, as has been forced upon our attention in the rapidity with which they perfected their atomic bomb and achieved the hydrogen weapon and the recent May Day flight over Moscow of advanced types of long-range and interceptor aircraft, certainly, indicates that they are able to achieve the end products and achieve them faster than was the prediction of our American scientific and military groups; is that not true?

Dr. KILLIAN. This seems to be the fact.

Mr. HOLIFIELD. So we must of necessity admit that without knowing the numbers that they are producing that they have made a remarkable scientific achievement in the last 10 or 15 years?

Dr. KILLIAN. Right.

Mr. HOLIFIELD. Mr. Lipscomb?

Mr. MCCORMACK. The answer is "Yes" for the record.

Dr. KILLIAN. Yes.

Mr. HOLIFIELD. Mrs. Griffiths?

Mrs. GRIFFITHS. In your judgment with the present known weapons of the Russians and the present known defense of this country is evacuation a sensible defense for the 10 major cities?

Dr. KILLIAN. First of all I don't know what the weapons are that the Russians have, so I can't base it on the question as you ask it. I would have to answer that question under any conditions in this way. I think these survival studies that are now getting underway together with the kind of program that the East River project strongly recommended we do in the 14 metropolitan regional zones is fundamental to answering this problem.

Unless you have these facts I don't think you can answer the problem specifically. I think that we cannot be sure that evacuation without having the backup of a fundamental study problem is the answer.

Mrs. GRIFFITHS. So that these cities that have practiced evacuation without such studies being made are going through useless exercises?

Dr. KILLIAN. I don't know how much information they had back of their studies.

Mrs. GRIFFITHS. But if done without a proper study, then it is probably useless?

Dr. KILLIAN. I don't know that it would be fair to say what practices they have had are useless. That may have very beneficial results to show them whether they can organize for evacuation. But I am talking about what really ought to be done if something happens.

Here we ought to make sure that we have the facts and work out a balance between preserving the integrity, the life of our cities, the process of shelter and informing the people how they can protect themselves versus evacuation.

I don't think you can generalize on this problem. This seems to me to be the very key to the situation. To say that evacuation is the solution or is not the solution is very dangerous in any given situation.

We ought to say after a complete study of all the factors involved, including the geography, the way the population is distributed, the transportation situation and all that, we have arrived at a firm conclusion that this pattern of evacuation and combination with shelter is the answer.

It seems to me that is the way we have to deal with this situation. I would not want to criticize evacuation tests or procedures because they may have real benefits in trying to work out whether evacuation is a sound policy.

Mrs. GRIFFITHS. Thank you.

Dr. KILLIAN. You may discover as a result of a practice that you have problems in evacuation that you have to find ways of meeting.

Mrs. GRIFFITHS. I would like to particularly congratulate you on what you consider to be the basic objective of civil defense. I think that is the first time anybody has said that here and I think you are quite right.

Dr. KILLIAN. Thank you.

Mr. BALWAN. On the survival studies, you say if we proceed on a regional basis to study the problem as the problem was suggested in the East River report or the review of the East River report.

Dr. KILLIAN. I referred to the review.

Mr. BALWAN. We are not proceeding on the basis of the suggestion in the East River report but under a survival-plan studies financed by the Congress last year calling for the cities themselves to make certain studies individually and I wonder if you could comment on the relative abilities to come out with some kind of study that can be brought into a regional context, as against the individual city approach and that individual approach applies generally to the way the organic law makes self-defense operate. It's not a policy of this administration or the previous administration, it's the way they have to work.

Dr. KILLIAN. The way the funds are allocated.

Mr. BALWAN. It is the way the law tells the civil defense to operate purely in an advisory capacity.

Dr. KILLIAN. I think the survival studies can be very useful and I see no reason why we should not go ahead and get those completed with all the talents we can muster. This is what I had in mind when I tried to emphasize this point and then if need be integrate these in the regional metropolitan concept that East River urges. I don't think the two are incompatible.

Mr. HOLIFIELD. I judge from the reference to the review of the East River project report that you have studied that report.

Dr. KILLIAN. I have read it, yes.

Mr. HOLIFIELD. Are you in general in accord with it?

Dr. KILLIAN. I am, yes.

Mr. HOLIFIELD. Are there any substantial differences in your mind with their recommendations?

Dr. KILLIAN. No, there are not. It seems to me—I must add that I still have not studied this field in detail—this seems to me to be as coherent and as carefully thought through a plan as I have seen anywhere.

Mr. HOLIFIELD. The subcommittee has been very much impressed with that report as well as the original study in 1952.

Dr. KILLIAN. I have been very much impressed by it. I don't know of any more complete authoritative presentation of this problem.

Mr. HOLIFIELD. We are glad to have your evaluation on that.

Dr. KILLIAN. I feel strongly that this provides us with a pattern of action and I think it warrants very careful attention.

Mr. HOLIFIELD. Thank you.

Mr. McCormack?

Mr. MCCORMACK. Doctor, in the world of today civil defense is just as much a part of our national defense as the Army, the Air Force, the Navy, the Coast Guard, the Marine Corps; is it not?

Dr. KILLIAN. I would say that it is a necessary part of our total defense function in this country at the present time. Whether one wants to say that it has as high a priority as the offensive military power is another matter.

Mr. MCCORMACK. My question is just as important a part in the world of today.

Dr. KILLIAN. I would say——

Mr. MCCORMACK. Because the wars are now between peoples not those in the services, combat units.

Dr. KILLIAN. If you would let me say that I think it is an absolute necessity to have an adequate civil-defense program.

Mr. MCCORMACK. As a matter of fact the child in the crib just born will be engaged in any future wars. They are actually engaged. They may not know it, but the enemy will try to kill them if they can. Is that right, Doctor?

Dr. KILLIAN. I think that every civilian in the event that we have war is a part of the process and is unless he is protected.

Mr. MCCORMACK. A very important part of the civilian defense is the state of mind of our people because public opinion in a democracy is a very important element.

Dr. KILLIAN. It is of fundamental importance to civilian defense.

Mr. MCCORMACK. We are quite complacent now you know. You're meeting a very complacent state of mind. Nobody figures that anything is going to happen. If you talk about the Communists today, they think you are a warmonger. I know I have the last several months, they think I am a warmonger when I attack the Communists, indicating how complacent the state of mind is among a substantial percentage of our people, which all bears on the question, particularly of the other question of civilian defense. Do you think that the civilian defense should be borne financially by the Federal Government or by both Federal and State governments?

Dr. KILLIAN. I would hope that it could be managed that both Federal and State governments share the responsibility as well as the expense.

Mr. MCCORMACK. I recognize the responsibility, but the expense of course——

Dr. KILLIAN. Whether the State governments can bear as large a portion of the expense as the Federal Government, I am not competent to answer, but I would urge the principle, as indeed does the East River review report that civilian defense to be successful and real must involve the understanding and the support and participation of local groups, both State and local.

Mr. MCCORMACK. That is true. I am talking about the money now. That makes the mare go. The old saying money makes the

mare go and you have to have the money for an effective civil defense to be developed, planned, put into operation.

For whatever benefit my views are, I have given it serious study as an individual and legislator, I think the primary responsibility rests upon the Federal Government because if an enemy should land a bomb on any of our cities, they are landing against the United States as such and it is an attack on the United States not a part of the United States.

Have you any views on that about the Federal Government bearing the great part of the financial responsibility?

Dr. KILLIAN. I certainly feel that the Federal Government must take the prime responsibility for the defense of the Nation. You can't defend the Nation on a piecemeal basis.

Mr. MCCORMACK. I would be very much interested——

Dr. KILLIAN. But I don't know the history of the allocation of expenses in the present civilian-defense program. I am not informed on that.

Mr. HOLIFIELD. Would you yield on that point?

Mr. MCCORMACK. Yes.

Dr. KILLIAN. I would say the primary responsibility being vested in the Federal Government, it has to make sure that we have an adequate program. I would hope, speaking now as a citizen that the local groups could recognize their responsibility to share in this, particularly through very active participation.

I am just not informed.

Mr. HOLIFIELD. Did you wish to reply to this last statement before I question him?

Mr. MCCORMACK. No. There is no question but that the States and localities are doing their part. I have every confidence in that. But when they are asked to bear the primary financial responsibility, I think it is a burden and obligation of the Federal Government.

Dr. KILLIAN. I am impressed by the recommendation in the review report of the East River project that these metropolitan target areas if they are created should have available to them Federal appropriations. I think they recommended something in the order of $100,000 to get the metropolitan target area organized and get the facts available as to how the civilian-defense program should be managed.

Mr. HOLIFIELD. This was for planning.

Dr. KILLIAN. This was for planning. That is right.

Mr. HOLIFIED. I think we might explore this because I think Mr. McCormack——

Dr. KILLIAN. This is clear, the Federal Government ought to provide the funds for this matter.

Mr. HOLIFIELD. The responsibility for the common defense, of course, is upon the Congress and the commander in chief.

Dr. KILLIAN. Right.

Mr. HOLIFIELD. Of our Nation. From a military standpoint, we approach that on the basis of Federal responsibility because we realize that the States were in themselves not able in piecemeal fashion to perfect a coordinated defense for the Nation.

Dr. KILLIAN. Correct.

Mr. HOLIFIELD. If civil defense is even in third position of importance, following offensive military action and defensive military action, it would seem to me that the same line of reasoning would

pertain also to the defense of our Nation from even any attack because as Mr. McCormack says, if they strike at any city in the Nation, its industrial production, its transportation network, not to mention the people, the millions of people that are involved in our most populous cities——

Dr. KILLIAN. And the fact that it breaks across State lines.

Mr. HOLIFIELD. Fourteen of which have over a million population. That would seem like to me to indicate that this should properly be a primary—not a complete—but a primary responsibility of the Federal Government.

Dr. KILLIAN. I would concur in this, yes.

Mr. HOLIFIELD. We had testimony from Dr. Libby before this committee on the first day of hearings in which he gave us certain figures, of the impact of the new weapons and I have an analysis of his talk here before me. And he estimated that if a 10-megaton weapon were dropped at a certain distance from the ground, there would be a radius of 12 miles of severe damage and a 6-mile radius of complete destruction of 18-inch brick walls.

You start squaring that radius and multiply it by pi and you come to the severe damage element of 380 square miles on the 12-mile radius.

Dr. KILLIAN. This is without fallout.

Mr. HOLIFIELD. This is without fallout. This is blast and thermal effect around the outlying area of this 12-mile radius; there undoubtedly would be a raging storm fire. There would be complete collapse of reenforced concrete buildings with 10-inch walls and 8-inch floors within a radius of 3.2 miles.

In view of that—and then he testified further that as to the facts of the 1954 explosion of the nuclear weapon which burned the Japanese fishermen some eighty-odd-miles away from point zero, that there was an elliptical pattern of radioactivity, radioactive fallout which covered 7,000 square miles.

When we start interpreting those facts, I think we must come to the reasonable conclusion that our civil defense if we have it must be based on those facts.

Dr. KILLIAN. Right.

Mr. HOLIFIELD. And should pertain to the area affected. That area which would be affected in many, many instances, particularly in the more concentrated population areas of our country would transgress city, county and many times State boundaries.

Therefore these planning items which the East River project recommended were on the basis of a hundred thousand dollars for the 14 most vulnerable or let us say the 14——

Dr. KILLIAN. Most populous areas.

Mr. HOLIFIELD. Most populous areas, that would be areas of a million population or more.

Applying that planning, a hundred thousand dollars of Federal planning to these populated areas, it is obvious if they should take into consideration all the factors involved, including the topography, ingress and egress roads, bridges and all that sort of thing, and once they come up with a plan for that particular area, would it be possible then for us to depend upon the voluntary cooperation and financing of the different little political subdivisions, such as cities, counties and in some instances States, to really bring forth an effective compliance with that plan?

Dr. KILLIAN. I would have to answer that from the practical point of view it does not seem as though you could depend upon that.

Mr. HOLIFIELD. In other words the Federal Government would have to do the job of planning in the first place.

Dr. KILLIAN. Right.

Mr. HOLIFIELD. Because if a city such as Los Angeles or Boston does their planning and they do it well and thoroughly and with great efficiency and with adequate financial support, assuming they have not reached the limit of their bonded indebtedness, they would still be in a position of hazard if all the outlying communities around them in the target area did not also do their component planning, if we are going to have safety for the target hazard area.

Is that not true?

Dr. KILLIAN. I would think that you would have to have an overall homogeneous group operating plan as well as a plan.

Mr. HOLIFIELD. This committee is aware and I know you are that the 1950 Civil Defense Act places the responsibility on the local cities, counties and States, and we have several hundred letters from mayors of cities and individuals and governors of our States in which they have all come to us, you might say, with this plea. "This is a study that needs to be done. We want to do what we can to help it. We are anxious to participate, but we are looking toward Washington for the information first that we need, which we have not had in many instances; secondly, we are looking for the overall planning and directing, which we have not had." And I think your East River report recognized that fact and said that the Federal Government should step in and start doing the planning in a test group of 14 cities to begin with to see how it would work out.

My question to you is, Do you think that type of thinking is sound and do you endorse it?

Dr. KILLIAN. I would endorse it with the emphasis again of the importance it seems to me of maintaining some feeling of participation and responsibility both in terms of people planning, participation as well as funds. I would hate to see the local officials relieved of all this responsibility.

Mr. HOLIFIELD. Your thought is that the Federal Government in sending their experts into an area should avail themselves of complete consultation and negotiation and that sort of thinking with the local people, informing them of the hazard in their communities from the standpoint of the superior knowledge which they should have on the Federal level of offensive and defensive capabilities, and in every way possible participation of the local communities should be brought to bear.

Dr. KILLIAN. I do feel that.

Mr. HOLIFIELD. Both as to the participation of individuals and as to financing to their capacity?

Dr. KILLIAN. Yes.

Mr. HOLIFIELD. But in the field of financing, do you or do you not believe that, if local communities are unable, either through lack of financial resources or other reasons to participate in a regional planning defense, that the Federal Government should do what it could to not penalize the rest of that hazard area?

Dr. KILLIAN. Stated in those terms, I think it would be necessary; yes.

Mr. HOLIFIELD. It would be necessary.

Dr. KILLIAN. But I still would urge that every effort be made to have the local communities feel they have a stake in this, because I think the whole philosophy of civilian defense rests very much upon the willingness and the commitment of our local groups.

Mr. HOLIFIELD. Local people.

Mr. MCCORMACK. There is no dispute to that, Doctor, but the question is, Where is the money? That is an important thing. You have to have the money. This is a national challenge and a national question, because, if any attack should come, it is against the United States. They might hit particular places in the United States, but it is an attack against our Government.

I have felt—and I have said this before—this is not a new thought. I said it some few years go at a meeting of the mayors, that the main responsibility financially rests upon the Federal Government. There has to be an origin. Of course, our States and our cities will cooperate. We have interested people. They are doing it now under difficulties. When the floods happened the civil defense stepped in there and cooperated. Those men responded. The organization is there. The will is there. But you have to have the means. And that costs money. It is going to cost big money and we have appropriated very little money. A governor of a State has his responsibilities and mayors of cities have their responsibilities, but it seems to me that we are justified in looking to the Federal Government for the major part of any appropriations to establish an effective civilian defense.

I have given a lot of study, and again we come up against human nature, human action and reaction. It is a national problem. It is a national question. The Federal Government should, in my opinion, assume the main burden financially. Then that has to be picked up locally, and there is where the main cooperation comes.

Dr. KILLIAN. This is not a matter that I have ever dug into, and I am not sure that I am really qualified to try to answer it. Beyond saying that I believe we have this very heavy responsibility and requirement resting upon us to have an effective civil-defense program, and if this is required to accomplish that, then I think this would be essential. I just don't know whether that is essential or not.

Mr. MCCORMACK. In your prepared statement you said:

> By a process of public discussion and of acquainting the public of the importance of technology, we can help to augment our progress in this field.

That prompts me to ask you a question.

Do you think our people should be given as much information as possible on the destructive power of nuclear weapons, ballistic missiles, and so forth, on the ability to live with them, warning period, and so forth?

Dr. KILLIAN. I think they ought to be given all information consistent with maintaining the necessary military security. And I think that only the experts in this problem can answer where that line should be drawn.

But we do need the people informed, if they are going to perform effectively in this kind of program. They need to know what the basic needs and objectives are.

Mr. MCCORMACK. Particularly in a country with public opinion as a potent factor.

Dr. KILLIAN. I am a person who has steadily advocated more information available to the public. But where the line should be drawn has to be decided by qualified, competent military people. I know no other way to answer the question than that.

Mr. MCCORMACK. Do you think—you say competent military people—there are other things than military involved in a democracy? Of course, ours is a civil government, not a military government. I know you know that. I agree on the question of secrecy where the national interest is involved. But sometimes it is extended if it is confined to one particular class.

Dr. KILLIAN. I was much impressed, for example, by the recommendations of the committee reporting to the Joint Committee on Atomic Energy with respect to the importance of making more information available for the peaceful development of atomic energy. I think this bears on your question.

Mr. MCCORMACK. You also said that most basic as the necessity to attract into engineering and science more first-rate people. Can you give us any idea during the past 5 years as to graduates of science and engineering work in the United States? Whether it has increased or decreased? Give us some idea. I know you have about as first-hand information as anyone. And also what you know about the Soviet Union.

It is a relative situation.

Dr. KILLIAN. The figures have varied in this country. At the peak of GI enrollment and when they produced the graduates at our great bulk, we turned out about 50,000 engineers in 1 year.

Mr. MCCORMACK. How long ago was that?

Dr. KILLIAN. Four years ago. The number has dropped since then and I think this last June we turned out twenty-three or twenty-four thousand, about. We must not necessarily compare that with the peak of the GI enrollment. But this is too low in terms of the needs of the country. This curve is turning upward. The number of freshmen who are electing to study science and engineering is increasing at the present time. So there is definite evidence that the understanding, the publicity, in regard to the importance of science is having its effect.

I think we are going to see a steady increase in the number of people studying in this field.

Mr. MCCORMACK. I know it is a matter of deep consideration to you and your associations in the field of higher education. I had lunch with you several weeks ago and with Admiral Cochrane during which we discussed it. Have you any information as to graduates in these professional fields in the Soviet Union?

Dr. KILLIAM. There is a very comprehensive and carefully worked out report by Mr. DeWitt that has just been published by the National Science Foundation that gives extensive data on the Russian output. It would indicate they are producing engineers at a rate about somewhat more than twice the level we are at the present time.

You have to get down and compare these in quality to really know what the situation is.

I am not sure we know enough yet about the quality of their output. There is no question that their output is larger than ours.

Mr. MCCORMACK. When you appeared before the Riehlman committee a very basic consideration was the relationship between the

scientists and the military on developing harmonious relationships so that they would be a team to produce the maximum results possible. Do you remember?

Dr. KILLIAN. Yes, sir.

Mr. MCCORMACK. Has there been any improvement?

Dr. KILLIAN. I think very definitely there has been improvement.

Mr. MCCORMACK. This all bears on the question of civil defense.

Dr. KILLIAN. Yes.

Mr. MCCORMACK. You said in your prepared statement, "We have not yet solved the problem of securing adequate funds for basic research as contrasted to applied research and development." Well, we found that to be a problem in the Riehlman subcommittee hearings you remember.

Dr. KILLIAN. Yes; I believe you made recommendations in this regard.

Mr. MCCORMACK. Would you mind elaborating on that and let us know just what your views are in relation to not having yet solved the problem of securing adequate funds for basic research as contrasted to applied research and development.

Dr. KILLIAN. One thing that I feel and hoped we might achieve in this country is a larger budget for the National Science Foundation and I understand that they have made, the Foundation itself has made proposals to Congress for an increase in its budget for the support of basic research. This is one place where we can get at this problem very, very directly. I would advocate very strongly that the budget of the National Science Foundation be increased. I think that there are many other ways of increasing our support of basic research other than through the use of Federal funds although I think Federal funds are very important to it too.

One is to encourage industry and the folks to support this work. There have been some developments in the last year or so that are encouraging in regard to this.

The Sloan Foundation has set up a basic research fund to support this kind of activity in the colleges. I would like to see more of this kind of thing done at the present time. I would think too that it is of fundamental importance even in the Department of Defense for the Department of Defense to provide funds for basic research that relates too to the applied and development work in the Department of Defense and it has been doing this of course.

I think this is a perfectly appropriate thing for the Department of Defense to do.

There is another kind of research that you would call supporting research that is essential in making possible our great development programs and here again I think we need to give very careful attention to making sure that funds are available for the kind of supporting research necessary to develop defensive systems, offensive weapons, guided missiles, and so on, because the supporting research frequently provides the basic data necessary to do the development work.

Mr. MCCORMACK. I noticed that Mr. Gardner, is he a scientist?

Dr. KILLIAN. I think he is a businessman primarily. I am not sure about that.

Mr. MCCORMACK. Is he an administrator?

Dr. KILLIAN. He is an administrator.

Mr. McCormack. Is he a good man?

Dr. Killian. I would certainly say that in all my contacts with him he has been very effective in encouraging and supporting research and development.

Mr. Holifield. Will the gentleman from Massachusetts yield?

Mr. McCormack. Glad to.

Mr. Holifield. We spoke a few minutes ago about the 14 sites mentioned in the East River project. In round numbers there are around 45 million people residing in those cities and from 20 to 30 million in nearby adjacent communities.

If the attack should come, surprise attack should come, in our present position of military defense, and our present position of civilian defense and if a breakthrough occurred and 10-megaton bombs were exploded over those cities, what would be the result in terms of millions of people whose lives would be snuffed out at this time?

Dr. Killian. I don't know that I am competent to answer that question. This would have to be determined by an all-out study in regard to where the bombs fell and the capacity of the bombs and all of that. I don't think you can give a generalized off-the-cuff answer to this problem.

Mr. Holifield. You would not hesitate to say in our present unprepared condition if that breakthrough did occur and the people having no more concept of what to do and civil defense no better organized than it is now, that millions of people would lose their lives?

Dr. Killian. I would have to say if we had an all-out surprise attack on a large scale there would be millions of casualties.

Mr. Holifield. Millions of casualties?

Dr. Killian. Yes.

Mr. Holifield. In view of the fact that you have brought——

Dr. Killian. If the bombs were delivered on target.

Mr. Holifield. If they were delivered; yes, sir. That would undoubtedly run pretty high because your total area of destruction in each one of those cities would be on the basis of a radius of possibly 4 to 5 miles of total destruction from ground zero, if they had a 3½-mile fireball for instance as was detonated in the 1954 explosion.

So you would have total destruction within a radius of something like 120 square miles in each instance; would you not?

Dr. Killian. Again you are better informed on this than I.

Mr. Holifield. You are not aware of the figures that Dr. Libby has given?

Dr. Killian. No; I am not. I have not seen those figures.

Mr. Holifield. As to total destruction.

Dr. Killian. No. I would rely upon his figures certainly.

Mr. Holifield. The second question I wanted to ask you was in your statement.

Mr. McCormack. But you do know, Doctor, that there would be a terrific destruction in any metropolitan city, a paralyzing effect, the loss of life would be appalling.

Dr. Killian. Yes.

Mr. Holifield. And if they were prepared and had taken shelter in the proper fashion, that could be cut down many, many times, could it not?

Dr. Killian. It could be cut down. I think you would have to depend upon the kind of survival studies we have been talking about

to determine what the prospects of cutting that down would be quantitatively.

I think the prospects of cutting it down are important enough and possible enough to warrant an effort to do so.

Mr. HOLIFIELD. The information already given this committee showed that within a certan number of miles where your radioactive fallout would be lethal if the persons were in the open, that the hazards could be reduced to one five-thousandths of that if they were under 3 feet of ground. On that basis, assuming they survived the thermal and blast effect, the protection from radioactivity could be greatly increased by the proper kinds of shelter; could it not?

Dr. KILLIAN. I would certainly think so; yes.

Mr. HOLIFIELD. In the present state of our defenses, with the lack of knowledge as to what direction the pattern of radioactivity would extend from a target area, would you care to evaluate the difference between taking shelter and attempts to evacuate these large populous centers?

Dr. KILLIAN. No; I would not without again having all the facts available, because I think it would be meaningless to generalize.

Mr. HOLIFIELD. Do you think this is an important study, a field that should be studied?

Dr. KILLIAN. I feel it is of fundamental importance.

Mr. HOLIFIELD. To determine in relation to the peculiarities of each target area the plausibility of evacuation or the necessity for shelter rather than evacuation.

Dr. KILLIAN. Yes.

Mr. HOLIFIELD. Would or would not that decision as to evacuation or shelter depend a great deal upon our certainty as to where point zero would be?

Dr. KILLIAN. Our presumption as to where point zero would be.

Mr. HOLIFIELD. Our presumption?

Dr. KILLIAN. Yes.

Mr. HOLIFIELD. In view of the fact that we have no certainty as to where point zero would be with any of these target areas, looking at it strictly from a percentage standpoint, which do you think would be the best evacuation or shelter for a massive population of say 3 or 4 million people within a potential target area?

Dr. KILLIAN. Again I would hestitate to try to answer that question, Mr. Chairman. I think in some areas evacuation might be best and in some areas that might not.

Mr. HOLIFIELD. Certainly——

Dr. KILLIAN. There are some people who feel strongly that evacuation is not the answer who have been looking at this problem hard and others who feel that a combination is the answer. I am not competent without having participated in a study of a given situation, to generalize.

Mr. HOLIFIELD. Is it most important that the people of these target areas be told from a responsible source after a complete study of their area what their best chances of survival would be in cases of attack?

Dr. KILLIAN. Yes; I would think this would be of fundamental importance.

Mr. HOLIFIELD. Do you think we have studied this problem enough?

Dr. KILLIAN. I think we have proposed the studies. I don't believe we have the data and the answers in sufficient degree at the present time.

Mr. HOLIFIELD. Do you know if there has been any move on the part of FCDA to follow out the recommendations of the 14 target-area studies made by the East River report?

Dr. KILLIAN. I do not. I know that survival studies are at least being started in some of our major cities.

Mr. BALWAN. This is individual city effort?

Dr. KILLIAN. Yes.

Mr. HOLIFIELD. This is not what the East River project recommended. They recommended a Federal study with the background of Federal knowledge for each one of these areas; did they not?

Dr. KILLIAN. Yes.

Mr. HOLIFIELD. Thank you, Mr. McCormack. I wanted to get those questions in at this point in the record.

Mr. MCCORMACK. Doctor, could you give us the benefit of any of your information as to whether or not the Soviet Union is ahead of the United States in the missiles program?

Dr. KILLIAN. I am not informed on this, Mr. McCormack.

Mr. MCCORMACK. Have we progressed very far?

Dr. KILLIAN. I think we are making steady progress.

Mr. MCCORMACK. My question was, Have we progressed very far?

Dr. KILLIAN. I am not sufficiently informed about the present status of the program to answer that. I do think that we have a very vigorous program from all I know. We have a very vigorous program under way.

Mr. MCCORMACK. The only time we have any opportunity getting information is when we get someone like you before us. If any questions are asked that you feel you should not answer, you should have no hesitancy in doing it.

Dr. KILLIAN. Thank you. I have not been in direct contact with the missile program so I am not qualified to evaluate its present status.

Mr. MCCORMACK. Before the Riehlman subcommittee and later the information obtained by the Holifield committee, there was a lot of testimony about the continental defense in its ability to inflict kills upon a potential enemy attacking through the air and at the time the percentage of kills was very low.

As I remember, you said and others testified that we could increase that to between 40 and 50 percent where a potential enemy might expect a probable kill of between 40 and 50 percent; is my memory correct?

Dr. KILLIAN. I am not clear as to whether I used numbers here or not. I certainly felt that we could increase the percentage kill. I think that we have been making steady progress toward increasing that percentage.

Mr. MCCORMACK. You stressed that as an important deterrent.

Dr. KILLIAN. Yes.

Mr. MCCORMACK. I notice that Mr. Gardner laid a lot of emphasis upon the intercontinental ballistic missile. Can you give us any information about the progress we have made in that and the progress made by the Soviet Union, either or both?

Dr. KILLIAN. I cannot.

Mr. McCormack. I am not drawing you into that situation.

Dr. Killian. I appreciate that; yes.

Mr. McCormack. I wanted to get this.

Dr. Killian. These questions like this are so important that casual answers or uninformed answers would be dangerous, and I don't think I should attempt to give that kind of answer without having direct and specific information to give to you.

Mr. McCormack. The newspapers quoted him as saying "I am concerned with the rate of our technological progress relative to a potential enemy. That was a quote which sort of concerned me considerably.

You said "We must have the strongest possible military means to deter war." Do you want to clarify that statement in any way or elaborate on it?

Dr. Killian. I would elaborate on it this way: that we must maintain our offensive striking power at the highest possible level; we must do everything we can to maintain weapons superiority in all areas in which we are involved in weapons development; that we must have a combination of offense and defense—and I think basically these things are inseparable; that they have to go along hand in hand—I refer back to the earlier discussion about priority here and I think that offense and defense are so inseparable that it is hard to say one has a position relative to the other.

They both go together. We must have a strong defense setup as well as a strong offensive setup and that we must be taut and alert as a nation to then deal with any condition that might arise.

Mr. McCormack. I was very much impressed with your observation that in the judgment of some people who have examined the problem thoughtfully it may be entirely possible for suggestions to be made for alteration of local building codes for new construction, and so forth, because I urged that 4 years ago.

Take the new Boston Common, if it were ever built, that is going to take care of several thousand automobiles for parking purposes underground, that for example could be a project where the material could be put in there to assure some degree of protection to people if an attack should come.

I thought that the extra cost, somebody should bear, you could not expect somebody building a project like that to bear the extra cost. But where any kind of a project was under construction that could be utilized in case of attack where people could rush in there and get some degree of protection, that it should not be borne by those who are constructing the building or whatever the project is but—extra cost that is necessary for protection—is that an illustration of what you had in mind, Doctor?

Dr. Killian. Yes; it is.

Mr. McCormack. Even take a building, it might save 500 or 1,000 people crowded in there. It would pay its dividends many times over, wouldn't it?

Dr. Killian. I don't know about the quantitative expression of it but I think structurally the design can be adapted to meet this hazard to some degree.

I think the structural engineers have the techniques to do this.

Mr. McCormack. And what you had in mind I assume is if there is any extra cost in connection with that, that is a field, that the Gov-

ernment, Federal Government or governmental action can properly enter into, in relation to the extra cost.

Dr. KILLIAN. I think again this would have to be related to specific building enterprises.

Mr. MCCORMACK. Would have to be what?

Dr. KILLIAN. Related to specific building enterprises. I can imagine an industrial company putting up a new building and making the decision that it will design this building against blast hazard and it would be perfectly willing to defray the extra cost involved itself.

So again I would not want to say that all effort to design against damage should be the responsibility of the Federal Government so far as cost is concerned.

Mr. MCCORMACK. But this is an important element in connection with the immediate problem confronting people when an attack comes and in connection with their immediate protection where evacuation would not be possible.

Take Boston. If they blow up a couple of bridges, anyone in Boston proper is caught in a trap; aren't they? It would be impossible to evacuate.

Mr. HOLIFIELD. The subcommittee has received a letter from the mayor of Boston, your friend John Hynes, and I believe it is quite pertinent that part of that be read into the record right at this time if you care to read it.

Mr. MCCORMACK. Would you want to do that?

Mr. HOLIFIELD (reading):

To date the Federal Government has not begun to do proportionately what the several target cities have themselves done and are preparing to do once Federal leadership and financial assistance are forthcoming. Further Federal stockpiling is not enough. It is but the beginning. Preparation and training in the use of stockpiled materials is a must.

Additional legal authority for our Federal civil defense administration is not enough. Implementation of this authority to the end that all Federal agencies will have a civil-defense emergency function and mission in addition to regular duties and responsibilities is an absolute necessity.

Increased Federal financial assistance to the several States and target cities is not enough. Cooperative planning and effective use of financial assistance to achieve a more coordinated and more effective nationwide civil defense is necessary. All agencies of supply must become part and parcel of our planning; and the means for emergency use of these must be determined now, in advance, if confusion and chaos in an emergency are to be avoided.

It is all too easy to criticize the various phases of civil-defense activity for the most part there has been all too little activity, it has not been effectively coordinated, and other agencies at the Federal, State, and local level have been slow to accept the civil-defense responsibility which naturally is theirs. Only through Federal assistance and action can this greater awareness on the part of all divisions and subdivisions of the Federal and State governments result.

I think it is a very wise comment on the part of the mayor of your city, Mr. John B. Hynes.

Mr. MCCORMACK. I have no further questions.

(The document referred to is as follows:)

CITY OF BOSTON,
OFFICE OF THE MAYOR,
January 3, 1956.

Hon. CHET HOLIFIELD,
Chairman, Military Operations Subcommittee of the Committee on Government Operations, 1611 House Office Building, Washington, D. C.

DEAR CONGRESSMAN HOLFIELD: I received your letter of December 9, 1955, in which you state that the Military Operations Subcommitte is making a broad

study of civil-defense problems and plans to hold public hearings in the next session of Congress.

I welcome the opportunity which your letter gives to me as mayor of the city of Boston to present my views to your subcommittee to assist it in its efforts, "to determine whether an effective civil defense can be provided." It is my considered opinion that nothing less than effective congressional leadership and assistance can provide the strong national civil-defense effort so desperately needed to combat the threat of an aggressor nation in this age of nuclear weapons. I am, therefore, pleased that your committee favors and proposes:

(1) Increased legal authority for those in charge of civil defense at the national level to coordinate and direct State effort in the several regions.

(2) Increased stature for the civil-defense agency itself and the personnel charged with meeting the grave responsibilities which an atomic emergency would entail.

(3) Increased financial assistance so that the manpower in the several cities and target areas will possess the heavy engineering equipment necessary for dealing with the effects of widespread destruction as well as the personal protective equipment which will lessen if not eliminate hazards from radioactive fallout.

Yours is a golden opportunity at the Federal level to provide legal authority and financial assistance which will substitute strength for weakness and leadership for inquiry at the national level and give to those charged with serious responsibliilities both the authority to carry them out and the financial means to underwrite the expenses therefor.

The increased effects of atomic weapons has made difficult and increasingly complex any attempt to provide adequate civil defense. Whereas it is relatively simple for a large city to inventory its resources of equipment and personnel and to institute a plan for utilizing the same even at some distance removed from their normal location, the increased effects of atomic weapons have so enlarged the extent of the area of probable destruction in our target cities and metropolitan areas that the complex problems resulting therefrom can only be solved through the combined efforts not only of the cities and towns in the metropolitan area but of those in areas as much as 30 to 50 miles removed therefrom. Such distances in many instances cross State boundaries and call for close cooperative activity at the Federal and State levels which can be secured only through interstate compacts under Federal leadership and guidance. It is true that these exist in some regions, but the strong directive force necessary to implement these compacts will continue to be lacking unless and until the Federal Government accepts its primary responsibility for civil defense. To date civil defense has been a local effort confined in large measure to our target cities. It must become a nationwide effort, and areas miles removed from our target cities must begin to accept a civil defense role on a statewide basis to supplement the target city's activity. Furthermore, every Federal agency together with all of its personnel and equipment must be prepared actively to participate in the local, State, and nationwide civil-defense pattern.

In the face of the many complex problems financial and otherwise which individually they cannot solve, the several target cities look in vain for assistance to the surrounding cities and towns which in a disaster would constitute a reception area. Nothing less than strong leadership at the Federal level with sufficient authority to remove legal obstacles and to make available large additional quantities of heavy material and engineering equipment can begin to make meaningful and effective the interest and effort of all who necessarily must be involved in the movement and mass care of millions of evacuees, even if they were but temporarily dispersed from our target cities.

Of one thing we are certain, we must prepare now to utilize the total resources of the city, State, and Nation to meet the threat of nuclear weapons. This we cannot do without cooperation, assistance, and leadership at the national level. The emergency legislation that has evolved in several of our States must become a pattern for legal planning and activity at the Federal level if the absolute authority and power necessary for an emergency is to be ready and available to those charged with civil-defense responsibilities.

To date the Federal Government has not begun to do proportionately what the several target cities have themselves done and are preparing to do once Federal leadership and financial assistance are forthcoming. Further Federal stockpiling is not enough. It is but the beginning. Preparation and training in the use of stockpiled materials is a must.

Additional legal authority for our Federal Civil Defense Administration is not enough. Implementation of this authority to the end that all Federal agencies will have a civil-defense emergency function and mission in addition to regular duties and responsibilities is an absolute necessity.

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It is all too easy to criticize the various phases of civil-defense activity. For the most part there has been all too little activity, it has not been effectively coordinated, and other agencies at the Federal, State, and local level have been slow to accept the civil-defense responsibility which naturally is theirs. Only through Federal assistance and action can this greater awareness on the part of all divisions and subdivisons of the Federal and State Governments result.

I am pleased to note that both House Joint Resolution 98, "To constitute the Federal Civil Defense Administration an executive department, and for other purposes," and House Concurrent Resolution 108, "Expressing the sense of the Congress that, in accordance with the Reorganization Act of 1949, the President should create within the Department of Defense a civilian Department of Civil Defense and transfer all functions of the existing Federal Civil Defense Administration to such new Department," are indicative of an awareness for the need for increased power, authority, and stature at the national level for civil defense.

May I express the hope that this or similar legislation be promptly approved and passed by both the House and the Senate to the end that immediate steps may be taken to correct and improve the posture of civil defense at the city, State, and National level.

Sincerely yours,

JOHN B. HYNES, *Mayor.*

Mr. HOLIFIELD. Mr. Lipscomb?

Mr. LIPSCOMB. Doctor, in answer to one of Mr. McCormack's questions you mentioned the need for additional funds in research to be appropriated. Have you any idea of the total amount of research expenditures that the Federal Government could effectively utilize with the manpower that is available to us, scientific manpower?

Dr. KILLIAN. I understand that the National Science Foundation has proposed a budget of $42 million, forty-odd million dollars. This is a substantial increase over what it had earlier received or had proposed. I think this represents one expression of the need and the opportunity at the present time to support basic research and I think it has been or would be a reasonable goal in terms of what the foundation's program could do and to find people to do it.

I think, however, that we have many people in the field of basic research already who could be more effective if they had more basic research funds and that it is not wholly a problem of manpower at the present time in this particular field, that we could do more with the existing manpower than we are doing at the present time.

Mr. LIPSCOMB. It is my understanding that in the budget, this next fiscal-year budget, there is well over a billion dollars that is in their fund for research and development.

Dr. KILLIAN. There must be more than that in the total Federal budget for research and development. It is closer to the order of $2 billion.

Mr. LIPSCOMB. Is it your thought that not enough of this money is being applied to basic research?

Dr. KILLIAN. It is my thought that there is not enough available for basic research at the present time.

Mr. LIPSCOMB Well——

Dr. KILLIAN. I would not be prepared to say that of the presently appropriated funds some project of an applied nature should be reduced in order to support basic research. Although that is possible.

Mr. LIPSCOMB. It is your thought then that we will say that there is enough scientific manpower to utilize all of the 2 billion plus more than that?

Dr. KILLIAN. That is a complex problem to answer. I think you would not only have to answer it in terms of whether we are doing this program now which we are, but you have to answer it in terms of looking at specific programs to decide whether we are doing them fast enough or well enough and I think there are many examples of where if we had more manpower we could be getting ahead faster under existing appropriations and we are probably moving into a period when the limitation will be manpower and not funds under the total research and development budget.

Mr. LIPSCOMB. The thing I want to be sure of is that there is enough money for research and development, the emphasis should be on that, but I had the impression that the appropriations were comparable to the amount of manpower that we had available at this time.

Dr. KILLIAN. Yes; I would feel very strongly that the appropriations, the total national income available and applied to basic research is not adequate to the manpower we have available at the present time in basic research.

Mr. MCCORMACK. I would like to pursue a little further—you say there has been an improvement in the relationship between the military and the scientists since the Riehlman hearings?

Dr. KILLIAN. Yes.

Mr. MCCORMACK. Could there be further improvement in your opinion?

Dr. KILLIAN. I think we would always have to say that we can create a better situation than the one that exists, but I think we have a very fortunate, a very effective relationship in operation at the present time.

Mr. MCCORMACK. That was not so back 3 or 4 years ago.

Dr. KILLIAN. I think it was not so; no. I think there has been a definite gain and a marked improvement.

Mr. MCCORMACK. I am very glad to hear that. I know that your conclusion carries with it sufficient weight for me without going into the detail and the evidence because you have that in your mind and it is based on experience.

Dr. KILLIAN. I feel very sure and certain about this from firsthand experience.

Mr. HOLIFIELD. We can also hope that this subcommittee's investigation in this subject has a beneficial effect on bringing about this situation.

Dr. KILLIAN. My comments about this report I think are in the record.

I think it was a very influential and a very effective report.

Mr. HOLIFIELD. Thank you.

Mr. Lipscomb?

Mr. LIPSCOMB. No further questions at this time.

Mr. HOLIFIELD. I noticed at the bottom of page 4 in your statement you said:

Finally as a part of a coherent civil defense program we need to make sure that we have the instruments and the methods of detection of radiological contamina-

tion and that adequate methods and instruments are available to civil-defense agencies.

There are several parts to that statement that I would like to question you on. In the first place, have we done the basic research necessary to develop practical instruments of the price that could be afforded for the detection of radioactivity contamination, radiological contamination?

Dr. KILLIAN. I am not sure that I have the facts on this, Mr. Chairman. My impression is that we do have the basic designs to do this. I am not at all sure that we have produced them and they are becoming available in the field so to speak.

Mr. HOLIFIELD. This has been one of the projects of the Atomic Energy Commission, to develop cheap radioactive detection instruments, and they have made quite a bit of progress along that line in design and even proper prototype manufacture in some instances, and I think you have instruments that are coming off the line, but in many instances they cost around a hundred dollars apiece for some of the Geiger counters and other types of instruments.

That doesn't mean there are not cheaper ones because there are cheaper ones; how trouble-free they are is another matter.

Do you believe at this time that adequate instruments are available to civil-defense agencies?

Dr. KILLIAN. From such reports as I have I would say that they are not available in adequate numbers at the present time.

Mr. MCCORMACK. I take it, Doctor, that you are not one of those who were taken in by the smiles of the Communist leaders, are you?

Dr. KILLIAN. I think my testimony——

Mr. MCCORMACK. You think we ought to be militantly on our guard, don't you?

Dr. KILLIAN. I think we have to maintain our relative strength and our readiness at all times.

Mr. BALWAN. May I ask a question, Mr. Chairman?

Mr. HOLIFIELD. On that point or a different point?

Mr. BALWAN. No.

Mr. HOLIFIELD. Let me continue with radiological detection instruments. We have a list here which shows that there have been since 1952, approximately, something less than a hundred thousand instruments bought by FCDA and they range in price from $9.18 which are simple dosimeters and up to long-range survey instruments around $79, ranging from $50 to $79.

That might be well to put into the record at this point.

Mr. BALWAN. Dr. Killian, during the past 4 or 5 months in connection with all this talk about the shortage of scientists, several suggestions have come up for relieving that and the Atomic Energy Commissioner, Admiral Strauss, and General Sarnoff have come up with the suggestion that some of the technicians we have working for the military departments and the universities should go into the high schools and teach.

Dr. KILLIAN. And from industry.

Mr. BALWAN. Would you care to comment on the feasibility of such a program? Would MIT want people from industry to come in and devote an hour or two of their time?

Dr. KILLIAN. Again it is awfully hard to say that an overall program of that sort is good or not good. You can say that a given man might be extremely effective if he were skilled as a teacher and had some experience in coming in. I think any effort of this sort ought to be encouraged, and I would support it. Because I think that the recognition on the part of agencies that they have a responsibility and opportunity to help, that is of fundamental importance. There have been lots of things done in local areas.

For example, the teacher-aid program that has been tried where parents and mothers having gone in to relieve the teachers of routine duties so the teachers can concentrate on the things they are most qualified to do; that apparently is working very well.

This is one kind of thing. I think it is possible that a program such as we have heard about in the Buffalo area where local industry has gotten behind ways of encouraging science teaching and giving professional part-time work to science teachers in the high schools is very important.

So that all of these suggestions are constructive and are possibly helpful in a given area.

In an institution of the college grade we are constantly calling upon people from industry to come to give special lectures and to participate in our educational program.

And the cooperation is extraordinarily good.

Mr. BALWAN. The National Science Foundation effort is primarily one in the realms of scholarships; is that right?

Dr. KILLIAN. No; they make basic research grants. They have had a graduate fellowship program and a postdoctoral scholarship program and have a program for basic research.

It is down the alley of encouraging new programs that need to be explored.

Mr. BALWAN. Have you any idea that the present shortage of scientists might be met through legislation providing for increased scholarships for students—the point you are making is that we probably have the people in our population which could get into the scientific effort if they could be encouraged some way. That encouragement could take many forms, having the proper teachers.

Also a child might be discouraged because he does not have money to go to school.

Have you made any proposals for any need to have a great mobilized effort to get great numbers of students into the colleges?

Dr. KILLIAN. I have not made such a proposal but I think it should be considered very specifically. If you are talking about Federal program for scholarships for high school students to go to college to study science.

Mr. MCCORMACK. We discussed that at lunch.

Dr. KILLIAN. Yes, we did. Many things need to be done of which a Federal program would be only one possibility. I am not completely clear in my own mind that a Federal scholarship program is necessarily the best approach to the problem.

Mr. BALWAN. Among the many methods, what is your feeling about being the best or the better?

Dr. KILLIAN. Again the key to my mind is getting enough good science teachers in the high schools to spot these youngsters and let them know that they have the competence and the opportunity to

move ahead in this field. One of the major things is not money but motivation although money is important too. There are a lot of youngsters who are not motivated to go on to professional work.

Mr. BALWAN. To some extent there is a money motivation in this in that although you reduce it down to the teacher problem, there may be a problem of keeping science teachers in the high schools and away from the competition with industry and the universities and the Federal Government.

Dr. KILLIAN. That is a major problem.

Mrs. GRIFFITHS. May I ask a question?

Dr. KILLIAN. Yes.

Mrs. GRIFFITHS. The GI bill of rights though with its increased participation in schooling did produce more scientists, more engineers at least?

Dr. KILLIAN. Yes, it did.

Mrs. GRIFFITHS. So it practically doubled it.

Dr. KILLIAN. Yes. But they increased all along the line I don't know whether the scientists or engineers increased relatively to a greater degree than the other fields or not, but the whole level of our college enrollment was pushed up.

Mr. MCCORMACK. How much could we rely on scholarships say from corporations?

Dr. KILLIAN. A great deal.

Mr. MCCORMACK. I introduced a bill to increase their deductions from 5 to 10 percent. I could see where that could be connected up with scholarships and might have a very important influence. One of the reasons I introduced a bill was in the hope that there would be increased scholarships as a result of it, definitely connected with it. That is they would have that extra 5 percent. They have 5 percent now for charitable educational purposes, so forth. If it was made 10 percent, the extra 5 percent could be connected with scholarships. What would be your opinion as to the value of that, not as an answer but as a contribution?

Dr. KILLIAN. I think that industrially supported, corporate supported scholarships are exceedingly important in our overall picture, that they are growing in numbers at the present time and that they are serving to attract more young people into college, more topflight young people and that this migth be one way to still further encourage the development of scholarships of this kind.

You would want to look at the facts as to whether corporations were giving their 5 percent at the present for this purpose.

Mr. MCCORMACK. The 5 percent now is for charitable, educational purposes, just like an individual has a deduction from gross income and I would not disturb that.

But if we could get in the light of the present situation, if we could get that through even if it were connected with scholarships, like there was an extra 5 percent for individuals that is connected with some specific purpose. We have 20 percent deduction now for general charitable, educational, and religious institution and an extra 10 percent if it is connected with some specific purposes.

If this extra 5 percent was put through connected with scholarships, I have always thought, I thought it would be a very important contribution toward meeting the problem that confronts us, particularly in the field of science and scientists and engineers.

Dr. KILLIAN. I am sure that the program might help.

Mr. MCCORMACK. I personally would do anything—I know my colleagues would—no matter how extreme, or how much I might oppose it under ordinary circumstances, the primary question that confronts all of us is the preservation of the United States of America, the national interest of our country and that means the first step, the first thought is the preservation. If necessary, I would even pass a law where we could let qualified young men continue their studies for doctorates and put them in a status where for a certain period of years the Government could call upon them for their services.

You could call that anything you want to, but certainly there is no question about the importance of the scientists in the life of any nation in the world of today and the world of tomorrow and if the preservation of this country is involved, we might have to take steps that would be a contribution toward assuring its preservation.

Dr. KILLIAN. I think the readiness of scientists and engineers to serve the Government is very apparent and clear and they are available when they are needed.

Mr. MCCORMACK. I think an important question—you know better than we do—is an economic question. We met it. We have all had that in the journey of life. The economic question. We can't eliminate it. Many qualified young men who are ambitious to go ahead but their family has not got the finances to do it.

Dr. KILLIAN. The reason I seem hesitant about the scholarship program both in terms of the Government and from other sources is that I think the problem may be made very complicated by the fact that there are other professional areas and other areas of learning that will inevitably come up for similar treatment if we set a precedent in supporting science and engineering but it may prove to be essential in order to solve this problem to do it.

Mr. MCCORMACK. We did it for doctors during the war. We can't eliminate—this is an emergency now where we can't prepare afterward, we have to be as well prepared before as we can before anything happens. We can't definitely anticipate the future but we can weigh reasonable probabilities.

Dr. KILLIAN. Yes. One proposal that has been made and I know has been considered by some committees in Congress is the tax deduction arrangement so that parents can get relief from their taxes in order to send their youngsters to college. This is a more wholesale attack on this problem.

Mrs. GRIFFITHS. Dr. Killian, if you feel that motivation of the child is especially important then do you think that the Federal Government would be justified in trying to supply that motivation even if it meant sending pamphlets into the schools or sending people into the schools to either help select the child or to urge the children on into this type of education?

Dr. KILLIAN. I would say that a more effective way in my judgment would be to also make clear to the American people in every way we can the importance of these fields, these professional fields to the national strength and I think the American people will respond and I don't believe you need to involve the Federal Government into doing that into going into schools——

Mrs. GRIFFITHS. But you would involve the Federal Government, though, in indoctrinating the entire people, even spending money to do it?

Dr. KILLIAN. I would not say indoctrinating it. I would say presenting the facts.

Mrs. GRIFFITHS. Presenting the case, all right. Even so you would have to have some group whose mission it was to do just that, wouldn't you, if it is to be effectively done?

Dr. KILLIAN. I think there are many groups that would participate in this, are participating in this mission.

Mrs. GRIFFITHS. If it is not successful now, those groups are failing.

Dr. KILLIAN. I don't think—I am not sure that we are failing at the present time, because the picture is changing definitely. I would be hesitant about creating some kind of agency whose primary function it would be to induce young people to go into a given area. It might rebound.

Mr. MCCORMACK. For example, I don't think Mrs. Griffiths had anything inconsistent with you, here, her problem is to mold public opinion, to appeal to patriotism, the importance to our country, reaching the minds of the young student who has the capacity and the ability to enter into these fields and it is not necesarily confined to these fields, there are other fields as you said.

My scholarship idea would not be confined alone to scientists and engineers but it would be confined to scholarships. If necessary there has to be some degree of compulsion.

Suppose it was necessary that the Government—we passed a law enabling young men to continue their studies for doctorates in the higher institutions, it would be voluntary on their part.

Dr. KILLIAN. Yes.

Mr. MCCORMACK. That is purely voluntary whether they would or not. If they accepted it, certainly if the Government is spending a large sum of money for their advanced education, the Government in case of necessity ought to have an opportunity for their service for a reasonable period of time. It seemed to me that one thing would follow the other, if necessary. That is the thought I had in mind. Everything would be voluntary on the part of the individual but once he voluntarily entered into a program, then certainly—and the Government expended substantial sums of money for the higher education—it seems to me that the Government, if necessary, should have the benefit of his services for at least a reasonable period of time.

Dr. KILLIAN. My comment upon that kind of commitment would be this. That you can never tell where that man can best serve the country and it may not be by working for the Government. It may be by staying in his private lab and making some new discovery that might have no apparent relationship to government at that time but might be profoundly important to the Nation later on.

It is of fundamental importance to let these able young people work where they can most effectively do creative things. And that may have no relation to any kind of formal commitment to government.

Mr. MCCORMACK. I don't think my observation is inconsistent with yours or your observation is inconsistent with mine. If this problem exists we have to meet it.

If as a result of your studies you find that the Soviet Union is graduating twice as many qualified scientists and engineers as we

are, and they are good in their professions and we are unable to attract the number that would be consistent with our national interest, why it would seem to me that we have to take steps within our scheme of government necessary to do so, because over and above everything is the national interest of the United States.

I wouldn't see anything inconsistent with it. I am not saying we should do it but I say we should not eliminate the thought if it is necessary to do so.

Dr. KILLIAN. I would be simply troubled by a formal commitment that such a person must work for the Government at some stage because that might not be the best way he could serve the Government.

Mr. MCCORMACK. Take myself. I would have loved to have gone to college but I couldn't. We did not have the financial means. There are tens of thousands of young men—I don't say I had any capacity when I was a young man but I would have loved to have gone to college. There is an economic problem that has to be considered and met. You appreciate it just as well as I do and you know of the thing, I think, because you have greater experience with it. But it is a very practical situation if the situation is such where, in the national interest of our country, we have to do certain things.

Dr. KILLIAN. I feel very certain that we must get more of the top quality people into college who are not now going in order to meet our national problem. The growing complexity of our society and the demands we have now require more people of top flight intelligence with proper professional education and competence and it may well be that scholarships of the kind that you describe would be one of the moves that we would want to make do this. Although I must confess that I have not reached a conclusion myself as to whether a Federal scholarship program for graduates of high schools is now the answer.

But this does not mean that I might not reach that conclusion and be in agreement with the kind of thing you have described. You were not talking about that either.

Mr. MCCORMACK. I was not talking about high schools nor was Mrs. Griffiths. She was talking about the matter of acquainting them with the problem and the necessity for their continuing their higher education. That's what you had in mind, wasn't it, Mrs. Griffiths?

Mrs. GRIFFITHS. Right. We may wake up any moment to find their scientists are as good as their Olympic teams.

Mr. HOLIFIELD. Are there any further questions?

Dr. KILLIAN. I think I should say that at the present time we have a position of great relative strength in technology.

Mr. HOLIFIELD. Are there any further questions of Dr. Killian?

Mr. BALWAN. I have a question.

Mr. HOLIFIELD. I have 2 or 3 announcements I wish to make as soon as Mr. Balwan asks his question.

Do you have more than one?

Mr. BALWAN. Yes.

Mr. HOLIFIELD. I will make the announcements now before our majority leader leaves.

I want to say we have been highly honored today to have our majority leader attend this subcommittee meeting. We know of his deep interest in research and development and in the question of civil

defense and we are always glad to have you with us and appreciate your contribution to our hearings, Mr. McCormack.

Mr. McCormack. Thank you, Mr. Chairman. I am always glad to be with the subcommittee. I am particularly pleased to be here because we have the benefit of listening to one of the greatest men in the world in Dr. Killian. That is my opinion of him. I am highly honored in being with you and receiving the benefit of his profound knowledge based on his—not only his academic qualifications but his great experience.

Mr. Holifield. Our appreciation of Dr. Killian concurs with your sentiments, sir.

Dr. Killian. Thank you very much. You are overgenerous.

Mr. Holifield. I would like to say at this time that we have been honored this morning by having Retired Admiral Sir Henry R. Moore and Lady Moore of the United Kingdom with us. Admiral Moore has a distinguished record—during the last war with Her Majesty's Navy—and Lady Moore has a distinguished record of interest in civilian defense in the United Kingdom, in Her Majesty's Government; she and her husband have been here before and we are glad to have them here again and we hope they will come back again.

The next meeting of our subcommittee will be on the 21st. Due to the absence from Washington of some of the members of our subcommittee on official duties and responsibilities to their districts, we will be unable to have meetings next week.

Our plan now is to have our next civil-defense hearing on the 21st of February and some time between now and then we will announce the list of witnesses for that week.

Thank you very much.

Mr. Balwan, will you now conclude with some questions.

Mr. Balwan. I think the chairman wants to finish up with some more questions.

Dr. Killian. I beg your pardon?

Mr. Balwan. You talk about a consideration is necessary, namely the need to adapt civil defense to new weapons and conditions of attack to which we might be subjected.

My question is, Is civil defense adapted to these new weapons and conditions of attack to which we might be subjected?

Dr. Killian. I think there has been a lag in adapting civil defense to the rapidly changing weapons technology picture, the kinds of things I was thinking of here in making this statement you have been examining into the whole question of fallout, the larger size of bombs and so on and that certainly has profoundly changed the whole aspect of civilian defense.

But it seems to me there must be a closer articulation between this kind of weapons change and our planning.

Mr. Holifield. In fact is it that it has made the legislation of the act of 1950, Civil Defense Act of 1950 obsolete?

Dr. Killian. I think this is a fair statement.

Mr. Balwan. How serious is this lag?

Dr. Killian. I wish I knew more about details about what is actually being done at the present time.

I am not informed about that; but I would say that the lag is serious.

Mr. Balwan. May I relate it to the next comments you have, as an

example you say "The need for an improved warning and communications system to pass a warning on to the people," you cite that as a need.

How urgently do we need that? Do you have any ideas how far behind we are in that?

Dr. KILLIAN. I am under the impression that we have not adequately worked through the warning technique and the warning system to take advantage of such warnings as we might conceivably get and as we develop through our military defense program further warning capability, we ought to keep our civilian defense warning capability moving along.

For example, the now publicized Dewline and the opportunities it promises for early warning means that we should have a very carefully worked out system of translating the information we get in accord with some predetermined plan to the civilian defense organization so that it can respond.

You probably are better informed than I am about the present stage of that; but my impression is that we have not completed the techniques or used the facilities that we might bring to bear upon the problem yet.

That picture again is changing.

Mr. BALWAN. You are referring particularly to our means for warning and the communication system that MIT itself is working on under contract through its Lincoln Lab from the comments you just made.

Dr. KILLIAN. This would be one of the factors in the picture, yes.

Mr. BALWAN. In that program would I be interpreting your remarks correctly by saying that there has been a great lag in that program?

Dr. KILLIAN. In the development of that kind?

Mr. BALWAN. Yes.

Dr. KILLIAN. No; I would not interpret it that way. That is a military development, as you well know, I think that has been moving along well.

Mr. BALWAN. Isn't that what you referred to in your statement when you talked about improved warning and communication systems; namely, the military development?

Dr. KILLIAN. No; I was referring to the tie between the military development and the civilian defense system, once the military system begins to yield information.

Mr. HOLIFIELD. In other words you are referring to the efficiency of the communication within the continental United States of warnings which may come from without?

Dr. KILLIAN. Yes. What is the civilian defense plan for warning the people and how do they go about it once we have information?

Mr. BALWAN. You would say there is a lag in our development there?

Dr. KILLIAN. I have gained the impression that we have not yet gone as far as we might in developing such a plan.

Mr. BALWAN. How might such a plan be devised? In your mind do you think that it is something that FCDA ought to do with its own people or ought we to get into an Associated Universities plan such as we have, Dr. Berkner is heading up or through some operations research operation such as Rand?

Dr. KILLIAN. In making this study?

Mr. BALWAN. Yes.

Dr. KILLIAN. I am not familiar with what Associated Universities is doing.

Mr. BALWAN. As a technique. That is a method of utilizing the efforts and facilities of universities to do a job.

Dr. KILLIAN. I think this is more a problem of our civil-defense organization getting a firm plan for handling its communication and for dealing with warnings which they would have to do.

I am not sure this requires any further research. It is a matter of developing a firm procedure. This would require close articulation with the military aspects of the warning system.

Mr. BALWAN. On your other comment in that same paragraph where you say:

> While I recognize full well that the general advisability of research has been accepted and is well understood and that larger funds are now available for research programs—

you are still relating this to civil defense I take it.

Dr. KILLIAN. Oh, yes.

Mr. BALWAN. "I also gather that the actual process of carrying out this research to conclusive useful results is still on the list of unfinished business," this is of particular interest to the subcommittee because yesterday we had testimony from Dr. Tuve and Mr. Bascom which stressed the great need for research programs.

I am wondering if you could elaborate on your statement that this is still on the list of unfinished business.

Dr. KILLIAN. Yes; I think the FCDA has been striving to enlist various research organizations and groups into this program that they have run up against the problem of shortages of manpower, incapacity of organizations to do the work because they are heavily committed otherwise.

I think they have a very tough problem in finding the research resources to do this kind of development work but I think it is of great importance that we persist in the effort to do some.

Mr. BALDWAN. We are both not in the level of effort we ought to be and then you state the explanation for it; namely, that we don't have the manpower.

Dr. KILLIAN. This is certainly one of the reasons. I know that FCDA has gone to various places to try to get them to take on research projects and those places have been limited in what they could do and there is a real struggle.

Mr. BALWAN. Has MIT been asked?

Dr. KILLIAN. It has been approached.

Mr. BALWAN. Are they carrying on any projects for civil defense in an operations analysis type of work?

Dr. KILLIAN. I don't recall that we have any formal work in the field of civilian defense at the present time. One of the reasons that we have not is that we are very heavily committed for military research and had been prior to this problem coming up.

Mr. HOLIFIELD. The type of work you are doing on the Lincoln project would tie right in.

Dr. KILLIAN. That's right.

Mr. HOLIFIELD. That would be a base on which you might say your civil-defense warnings and communications and so forth can depend.

Dr. KILLIAN. The whole early warning system is of fundamental importance here.

Mr. HOLIFIELD. Could you give us a word of hope on that that within a period of the next 2 or 3 years there will be great improvement in our warning system so we can anticipate longer times of warning in case of an attempted enemy infiltration?

Dr. KILLIAN. I think the completion of the early warning lines will enormously help our position in this area and they are being pushed through at a great rate at the present time.

You never know when you run into obstacles in these kinds of things, in the actual construction process and the problems of weather and all that.

Mr. HOLIFIELD. There is no real lack of funds at this time in that project as far as you know?

Dr. KILLIAN. Not to my knowledge. I am not informed about the present status.

Mr. HOLIFIELD. You are proceeding as fast as you can to put into effect technology which you already know.

Dr. KILLIAN. I believe this is correct. Although I think there are problems in relation to certain subsidiary aspects of early warning that need to be pursued.

Mr. BALWAN. What are some of the problems?

Dr. KILLIAN. More aggressively. This involves I think classified information.

Mr. BALWAN. Do you want to discuss that in executive session for a couple of minutes, Mr. Chairman?

Mr. HOLIFIELD. If you have time to stay for a few minutes, Dr. Killian.

Dr. KILLIAN. All right.

Mr. BALWAN. Is not the development technologically of our defense through our warning system a function of the developments technologically of the offense. In other words we have to keep up with our defense program at such a rate so that we, what we gain in time definitely in warning will keep up with the development of the offense.

Dr. KILIAN. You mean the faster speed of enemy planes and so on?

Mr. BALWAN. By the time we get a defensive warning system set up to take care of a jet bomber of what we have today we may be superseded by other weapons. The planning must be kept up with the offense.

Dr. KILLIAN. Very definitely. The problem of warning and defense that may be involved we know when ballistic missiles become a reality is a very difficult one.

Mr. BALWAN. Yes; that is true.

Mr. HOLIFIELD. Throughout our history, Dr. Killian, the pendulum of advantage has swung back and forth between offense and defense with the introduction of new weapons of offense and defense. Would it be fair to say at this time that the pendulum has swung quite a way to the advantage of offense?

Dr. KILLIAN. Yes.

Mr. HOLIFIELD. In view of the strength of the weapons?

Dr. KILLIAN. The nuclear bomb has profoundly affected this.

Mr. HOLIFIELD. This ties down to the point of whether we set the figure of interception of enemy planes at 30 or 50 percent, that if 50 percent get through, with the capabilities of destruction that they

have today, it is a matter of tremendous importance to the people of the United States that they be given every chance to survive that breakthrough.

Dr. KILLIAN. Right. Just to use your figure of 50 percent, if we can have an attrition of 50 percent that would be a profound factor in the judgment of the enemy as to what he might want to do.

Mr. HOLIFIELD. I agree with you.

Dr. KILLIAN. But the 50 percent, if they got through, would bring appalling destruction.

Mr. HOLIFIELD. According to the strategic bomb survey, to put that into proper relation—I can't recall the name of the author; it was done for the military department—there were 2,239,000 TNT ton equivalents dropped in World War II by 22,000 British and American bombers. This, of course, is less than a quarter of a 10-megaton nuclear weapon which could be dropped by one supersonic jet carrier in equivalent TNT ton force. So we are facing a position today where lack of a total defense which we cannot hope to achieve is a very serious factor and which a very limited defense and a limited capability of the civilian population to withstand the shock would be a very serious problem, and it is the hope of these hearings that we will hit even that deterrent quality which you spoke of of giving to our Nation advice as to how we can have a really effective civil defense.

Dr. KILLIAN. First rate.

Mr. BALWAN. Dr. Killian, in the next paragraph you say:

I urge the vital importance of our Government's carrying through to completion those analyses and studies which throw light on the casualties to be expected from various thermonuclear attacks and on various conditions of evacuation and shelter.

I take it from that that you are asking that they be carried to completion, that you understand they are not completed.

Dr. KILLIAN. I was thinking particularly here of the survival studies in the cities which have to deal with this problem and then beyond that if we should implement the recommendations of the review of the East River report that the larger problem of the 14 regional centers would be completed.

Mr. BALWAN. How does that tie in with your sentence which says:

If such studies are to be really effective and conclusive they should be made by groups that have had available all the necessary classified data.

Dr. KILLIAN. I think you can——

Mr. BALWAN. You assume that the groups that are making these survival studies have available the necessary classified data?

Dr. KILLIAN. I am saying if they are going to do an effective job they must have the relevant classified data available.

Mr. BALWAN. Is there any significance to your statement in terms of whether they have the data or not?

Dr. KILLIAN. This is in line with my general point of view that the survival studies must be done with complete relevance to produce the sound base that is necessary.

They are really getting started around the country now, and I don't know to what extent the relevant classified data is made available to them.

I am urging that it be made available to them.

Mr. BALWAN. You would be concerned if you knew that city directors of civil defense do not have people on their staffs cleared to have this kind of data?

Dr. KILLIAN. I would be concerned if these studies were made by people who did not have clearance.

Mr. BALWAN. How about techniological competence?

Dr. KILLIAN. This is important too. I think it is very important that you get first-rate competence involved in making these studies. I make that point in another place.

Mr. BALWAN. So it would be very important for the subcommittee in carrying out this study to find out from the cities the kind of people they have making these studies.

Dr. KILLIAN. I think this would be very useful. You can't do this kind of thinking superficially or casually. It has to be rigorous. It has to have the facts and people competent to interpret those facts and draw proper conclusions else you are going through a process that will be exceedingly dangerous in its superficiality.

Mr. BALWAN. There is $2 million appropriated for these survival studies and they are being done by the cities themselves.

Mr. HOLIFIELD. Thank you very much, Dr. Killian, for your time today.

We appreciate it very much.

Dr. KILLIAN. Thank you for your courtesy.

Mr. HOLIFIELD. If you can stay for a few minutes for a couple of executive questions, we will be pleased.

Dr. KILLIAN. All right.

(Whereupon at 12:15 p. m. the subcommittee adjourned to reconvene on February 21, 1956.)

APPENDIX

EXHIBIT 1

FEDERAL CIVIL DEFENSE ADMINISTRATION

Battle Creek, Mich.

ADVISORY BULLETIN No. 187

MAY 12, 1955.

To: State and Local Civil-Defense Directors
Subject: FCDA Planning Assumptions for Fiscal Year 1956

I. PURPOSE

The purpose of this advisory bulletin is to transmit to State and local civil-defense directors the FCDA planning assumptions for the fiscal year 1956, beginning July 1, 1955.

II. DISCUSSION

A. Although these assumptions have been prepared to cover the period from July 1, 1955, to June 30, 1956, it will be recognized that many of them have remained relatively constant for several years and will apply to civil-defense planning for a considerably longer period. A few assumptions, such as warning time, may be expected to change from year to year.

B. To emergence of radioactive fallout as a serious hazard has required a broader view of probable targets and areas of damage. This does not imply any lessening of the probability that critical target areas listed in Target Areas for Civil Defense Purposes would be struck, but simply that the affected areas around them would be larger than formerly expected.

C. These assumptions incorporate for the first time the possibilities of surface bursts, particularly of weapons of high yield, and the influence of the resulting radioactive fallout on civil-defense planning. Special civil-defense measures will be required in the areas of contamination from residual radiation. Compared to the areas seriously affected by heat and blast, these fallout areas will be extremely larger and may be affected by radiation intensities so high that most civil-defense activities will have to be postponed or conducted with great caution.

However, as protective measures, including fallout prediction, are improved and proper precautions are taken to avoid exposure, the threat of residual radiation as a mass producer of casualties can be minimized during fiscal year 1956. Of special significance to civil defense is the fact that adequate protection against dangerous fallout is usually found in and around American cities and, if proper precautions are taken to avoid exposure, casualties from radiation can be reduced considerably. To achieve this reduction, civil-defense services must vastly increase the capability of radiological services, including forecasting, monitoring, protective measures, and decontamination.

D. These assumptions cannot be all-inclusive in information bearing on civil-defense planning. In using them, reference should be made to many other documents of application to present planning, such as the following:

1. Advisory Bulletin No. 182, March 4, 1955: Civil Defense Public Action Signals
2. Advisory Bulletin No. 179, February 9, 1955: Residual Radiation in Relation to Civil Defense
3. Technical Bulletin 27–1, February 1955: Evacuation of Civil Populations in Civil Defense Emergencies.
4. Advisory Bulletin No. 158, January 18, 1954: Forecast of Policy with Respect to Early Warning of Air Attack and Dispersal of Population

5. Supplement No. 1 to Advisory Bulletin No. 158, September 23, 1954: Evacuation of Civil Populations in Civil Defense
6. Target Areas for Civil Defense Purposes: Official list as of July 1, 1953

E. As stated in the foreword, these planning assumptions are made on a national basis and do not have equal applicability to all areas of the country. They are not be regarded as inflexible directions to the States and cities, but rather as broad, general guidelines. We recommend that you use them in this way, adjusting your planning to them as far as you find it reasonably possible and consistent with the probable emergency role of your particular State or city.

III. PUBLICATION

This material will be released to the press and there is no restriction on its publication.

VAL PETERSON, *Administrator.*

ATTACHMENT A

FCDA PLANNING ASSUMPTIONS, FISCAL YEAR 1956—MAY 12, 1955

FOREWORD

The planning assumptions in the following pages give a broad national basis on which civil-defense plans can be made at all levels. It is suggested that State and local authorities review the applicability of these assumptions to the specific conditions in their areas and use them in the development or modification of their plans.

These assumptions are based on the most recent known or estimated capabilities of the Soviet Union to attack the United States. They are consistent with classified intelligence sources, but do not reflect their detailed content.

The problem of radioactive fallout is a new and major element in the assumptions for fiscal year 1956. This complex problem has been described in FCDA Advisory Bulletin No. 179, which includes the general outlines of recommended protective measures.

These planning assumptions are not to be regarded as predictions of what the Soviets would do if they did attack. For obvious reasons, there can be no precision in predicting the type of attack that might be visited on this country, the pattern of that attack, or the weapons that might be used.

I. TYPE OF ATTACK

It is accepted that the Soviet Union has the capability of striking any target within the United States.

A. It is assumed that if the United States is attacked the principal weapons will be nuclear [1] bombs of varying sizes delivered by aircraft or by submarines.

B. It is assumed that some of these weapons will be detonated in the air and others at ground level. If detonated at or near the ground, radiological contamination in lethal concentrations will be produced in areas far beyond the zones of blast and thermal damage.

C. It is assumed that incendiary and chemical warfare weapons will also be used.

D. It is assumed that sabotage will be employed, involving clandestine use of nuclear, biological, and chemical weapons.

E. It is assumed that psychological warfare will be used in an attempt to disrupt defense programs, impair production, create panic and despair, and weaken our will to fight.

F. It is assumed that the enemy's initial attack will be an attempted knockout blow, to be followed by other attacks of varying intensity, and that a large proportion of the weapons carried will be delivered on target.

Discussion

If this country is attacked, the primary objectives of the enemy will include centers of industrial production, and concentrations of our civilian population as well as bases of military retaliation. Since nuclear bombs are the most effective weapons of mass destruction now available, it is probable that the

[1] The word "nuclear" in these planning assumptions includes all types of atomic and hydrogen weapons.

enemy would rely mainly on them. The most reliable means of delivery is the long-range bomber, although nuclear weapons might be launched by submarines off our coasts, or smuggled into the country. From the standpoint of warning, the method of delivery affects civil-defense planning.

Nuclear weapons detonated at or near ground level, particularly those of high yield, cause residual radiation in lethal concentrations over areas far beyond the radius of blast and thermal effects. Radioactive fallout in intensities dangerous to persons who do not take protective measures can be carried by the winds of the upper atmosphere for a considerable distance downwind from ground zero. It is therefore regarded as probable that this type of burst will be used for such weapons.

The dimensions and shape of the fallout pattern are influenced by the whole complex of upper wind currents, but generally the area of highest intensity has a somewhat elliptical shape.

It is believed that civil defense measures designed to meet nuclear attack will also be sufficient to meet any accompanying incendiary attacks. Special defenses against biological and chemical attacks are a continuing necessity. Psychological warfare will be used in an attempt to create confusion, panic, apathy, and despair. We must be prepared to meet a flood of false rumors, disseminated by word of mouth, by leaflets, and by clandestine radio.

It is recognized that any type of attack will be accompanied by attempts at sabotage of industry and communications, and that enemy capability for clandestine introduction of nuclear weapons might cause serious problems. The effects of such covert activities will probably be minor, however, compared with those of overt attack.

II. PROBABLE TARGETS

A. It is assumed that concentrations of population and industry and bases of military retaliation will be primary targets for nuclear attack.

B. It is assumed that chemical warfare and biological warfare attacks will be carried out in rural as well as urban areas.

C. It is assumed, as already indicated, that radioactive fallout in dangerous concentrations will spread not only over cities but over considerable areas downwind from the burst hitherto thought to be relatively safe from the effects of nuclear attack.

Discussion

For civil-defense planning purposes, large concentrations of population and centers of industrial production are regarded as the most probable nonmilitary targets for nuclear attack, since the return per bomb in damage and casualties would be greatest there. Each of these areas may be struck. Each one must, therefore, be fully prepared, even though all actually may not be hit at the same time, some possibly not at all. Areas downwind from any targets including bases of military retaliation may be affected by fallout from attacks on those targets whether or not the areas themselves are struck directly. Since no one can predict where the enemy will strike, and since radioactive fallout will not be confined to the larger industrial and population centers, every community, large and small, should be prepared.

Chemical warfare and especially biological warfare may be used against persons, animals, or crops. The targets for these forms of attack are therefore not limited to the cities, and preparations to combat them should be made in all agricultural regions.

The problem of fallout also affects rural and urban communities alike, since the areas over which it can reach damaging proportions are determined largely by the size of the weapon, wind direction, and other weather conditions prevailing at the time of attack.

III. BOMB SIZE AND PHYSICAL DAMAGE

It is assumed that the Soviet Union can make nuclear weapons of varying yields, ranging from a few thousand to millions of tons of TNT equivalent. It is therefore assumed that any city attacked with nuclear weapons can be substantially destroyed.

Discussion

Atomic bombs have been produced more than 25 times as powerful as the weapons with which the atomic age dawned, while hydrogen weapons are in the ranges of millions of tons of TNT equivalent. It is impossible to predict

how large a bomb would be used on any given target complex. It is probable that the enemy will choose the most efficient size from the family of weapons. Where two or more bombs are needed to accomplish his objective, they would be used. Damage from such weapons would substantially destroy administrative, industrial, and commercial facilities of a city.

In view of the constantly expanding capabilities of the Soviet nuclear weapons program, civil-defense planning should anticipate increases in the numbers and sizes of multimegaton weapons which may be used against us.

IV. SUPPORT

It is assumed that any area attacked will require outside support to meet the emergency. Mutual aid alone will not be sufficient, and both mobile and fixed support will be required.

Discussion

This assumption is a major premise in the operation of civil defense. The capabilities of nuclear and other weapons are so great that an attack, if successful, will result in damage and casualties far beyond the resources of any community.

Assistance to attacked communities must come from outside and possibly from great distances. It must be organized in advance of an attack in order to be available when required. This means that available resources of the entire country, outside potential target areas as well as within them, must be geared into the civil-defense system.

V. WARNING TIME

A. It is assumed that in case of an attack during fiscal year 1956, Warning Yellow will be received at points along the Canadian border and the Atlantic, Pacific, and gulf coasts 1 hour before Warning Red.

B. It is assumed that warning time will be progressively greater in the rest of the country, up to 3 hours at points in the interior.

Discussion

With the continuing progress in the development of radar networks and other protective measures, the probability of a surprise attack is constantly diminishing, but the possibility still exists. There can never be complete assurance of a specific warning time in a given area, but it is believed that during fiscal year 1956 our defenses will have progressed to a point where for civil-defense planning purposes we can reasonably count on 1 hour between Warning Yellow and Warning Red along the Canadian border and the Pacific, Atlantic, and gulf coasts. It follows that the interior of the country can expect more than this, up to 3 hours in some States. Although surprise may be achieved in some areas, possibly by submarine-launched guided missiles, by clandestine attack or even by air attack, an attack on one area would warn the rest of the country.

VI. DISPERSAL OF PEOPLE

A. It is assumed that by fiscal year 1956 most of the principal cities will have been able to plan for a partial dispersal of their population from the areas of greatest concentration on the receipt of Warning Yellow.

B. It is assumed that radioactive fallout will affect the operating details of evacuation policy. It will also require areas outside the target complex to develop shelter plans and possible exacuation measures.

Discussion

In fiscal year 1956 civil-defense authorities will have had about 2 years in which to develop plans for dispersal. Test exercises have shown not only that the use of motor transport is feasible but that greater distances can be covered by large numbers of people in a given time than was formerly thought possible.

Although the primary objective is to move people out of the areas of probable blast and thermal damage and immediate radiological effects, the possibility of radioactive fallout now makes it desirable to develop a high degree of flexibility in evacuation operations. Alternatively, provision should be made for sheltering people in areas where evacuation is not feasible.

EXHIBIT 2

AN ANALYSIS OF THE PUBLIC COMMENT ON THE WARNING SYSTEM IN WASHINGTON, D. C., OPERATION ALERT, JUNE 15, 1955

By Harold Mendelsohn

This analysis was based on the comments of 102 newspaper readers who submitted responses to questions on the June alert test that appeared in Washington newspapers: on the comments of 83 police officers who were requested to fill out reports on the test; and on the comments of 25 wardens who were requested to submit similar reports.

Substantively these comments do not have much of a contribution to make, since the characteristics of the writers remain unknow. Thus, the findings cited in the report are to be considered more in the realm of insights rather than as conclusive evidence.

Some of the more interesting insights are related to the fact that the most frequent remark made by the newspaper readers related that prior preparations for hearing the signals helped them hear them. Without this preparation, a good number indicated, hearing the signals would have been almost impossible.

The second most frequent remark indicated that being indoors affected audibility in a negative way.

Comments by the public and the police and warden personnel indicated that a good deal of confusion over the meaning of the signals was in evidence.

Rounding out the comments were those which were critical of civil defense and its efforts and which suggested improvements in the warning system. "Make the present signals louder" was the suggestion most frequently made.

Perhaps the real advantage of this analysis lies in its implicit suggestion for future research. It is clear that future studies of public reactions to alert tests should try and get an explicit as possible pictures of the conditions under which the signals were heard or not heard. Data pertaining to the recognition of the signals as well as to satisfactions with the signals and civil-defense activities should also be included. Detailed characteristics of the respondents should be included as well.

One of the more obvious suggestions that arises is that future tests which are planned to be studied should incorporate as much of the surprise element as possible.

1. NEWSPAPER READER'S COMMENTS

Table I indicates that newspaper readers who reported hearing either the alert or take cover signals faintly were generally more prone to comment on the audibility of the signals than were those who heard them clearly.

Hearing the signals clearly evoked the least comments on audibility.

TABLE I.—*Audibility of signals by readers making comments*

Audibility	Alert percent of 102 readers	Take cover percent of 102 readers
Signal was loud	18	12
Signal was faint	60	51
Signal was not heard	19	27
No answer	3	10
Total	100	100

Table II shows that readers who commented on the audibility of the "alert" signal only were those who primarily reported hearing the signal faintly.

The most frequent remark here was that the readers were prepared for the signal and therefore managed to hear it. In two case the signal was not heard at all despite the fact that the readers were waiting for it to sound.

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TABLE II.—*Comments on audibility of "alert" signal only*

Comment	Heard alert loudly (18)	Heard alert faintly (62)	Did not hear alert (19)
Respondent was waiting for signal		9	2
Respondent was indoors	1	9	
Respondent was outdoors and should have heard signal clearly		8	
Traffic noises interfered		4	
Other noises interfered		4	2
Future signals would have to be unique if they are to be heard		3	

The pattern concerning audibility of the "take cover" signal was very similar. Most comments came from readers who reported hearing the signal faintly. The most frequent remark suggested that had the respondent not been prepared for the test, he probably would not have heard the signal at all.

TABLE III.—*Comments on audibility of "take cover" signal only*

Comment	Heard "take cover" loudly (12)	Heard "take cover" faintly (52)	Did not hear "take cover" (28)
Respondent was waiting for signal		9	1
Respondent was indoors	2	3	3
Respondent was outdoors and should have heard the signals clearly		3	1
Traffic noises interfered	1	3	
Other noises interfered	1	3	1
Future signals would have to be unique if they are to be heard		2	
Was asleep		1	1
Was near signal that did not go off			1

Again the same pattern was discerned in the comments that related to the audibility of both signals (table IV). Predominant complaints pertained to the fact of being ready for the signal and to the fact that being indoors generally hindered audibility.

TABLE IV.—*Comments on audibility of both signals*

Comment	Both signals loud (7)	Both [1] signals faint (40)	Both [1] signals not heard (8)	Both signals, 1 faint (11)	Both signals, 1 not heard (30)
Respondent was waiting for signals	1	22			6
Respondent was indoors	3	10	4	1	6
Outdoor noises interfered with audibility	3	2	3		
Indoor noises interfered with audibility		2	1		1
Future signals would have to be unique if they are to be heard			4		
Audibility would depend on being awake		3			1
Audibility would depend on absence of noise		2			1
Other comments		3			

[1] More than one comment on audibility was made by a number of individuals.

Recognition of signals

Comments on the recognition of the warning signals indicated some difficulty in disentangling the air raid warning signals from other similar sounds.

TABLE V.—*Recognition of signals*

Comment	*Number*
Warning signals confused with other signals	11
Respondent indicates that others did nothing to indicate compliance with warning signals	4
Could not distinguish the "alert" from the "take cover"	2
Indicates evidence of general confusion over the meaning of the signals	2

Suggestions for improving the warning system

Of the 102 newspaper readers writing comments on the test, 21 offered suggestions for improving the warning system.

As table VI indicates, the two most frequently mentioned suggestions pertained (*a*) to making the present signals louder and (*b*) to placing additional signals closer to respondents' homes or places of work.

Suggestions for placing more signals around town and reverting to the World War II warning system were mentioned next in frequency.

TABLE VI.—*Suggestions for improving warning system*

Suggestions	*Number*[1]
Make present signals louder	8
Place additional signals closer to respondents' home or place of work	8
Place more signals around town	3
Revert to World War II warning system	3
Make warning signals unique	1
Adopt system in other locality	1

[1] Although 21 readers made suggestions, 3 individuals made more than 1 suggestion.

Comments on civil defense

The newspaper readers offered a number of comments that were critical of the local civil defense agency:

General criticism of the agency	2
Criticism of civil defense's lack of communication with the public	2
Criticism of civil defense's warning equipment	2

Other comments pertained to criticism of civil defense personnel (1), and to criticism of "conelrad" (1).

Civil defense was praised by one reader for giving the public an opportunity to comment on the test.

One comment each criticized local warden service personnel; criticized Federal civil defense programs; and criticized Federal civil defense equipment.

Other comments

Further comments by the public outlined special difficulties that were encountered in the evacuation exercise (4); and criticized the practicality of the evacuation program (2).

A miscellany of comments rounded out the responses from the newspaper readers.

Four readers felt that the test demonstrated that survival under an actual attack was almost impossible.

Two readers felt that civil defense should carry on an extensive public information program.

The following types of comments each came from one reader:

How will the real thing differ from the test?

The test was adequate, but are we prepared for an actual attack?

The next alert test should come as a surprise.

Don't depend on evacuation; build more shelters.

Adopt civil defense programs of other localities.

Nine readers made specific requests for information ranging from how to join a civil defense unit to how one can get special evacuation passes.

II. POLICE REPORT COMMENTS

Of the some 750 police reports that were received, 83 contained a variety of comments.

Unlike the newspaper readers, however, the majority of the police comments reported hearing both the "alert" and "take cover" signals as being loud (table VII). This was due perhaps to the fact that the majority of this group no doubt witnessed the signals under conditions approaching the ideal—outdoors.

TABLE VII.—*Audibility of signals by police making comments*

Audibility	Number	
	"Alert" signal	"Take cover" signal
Signal was loud	50	49
Signal was faint	30	28
Signal was not heard	3	5
No answer		1
Total	83	83

Because most police who made comments heard the warning signals clearly, remarks on the audibility of the signals were few and scattered. Generally, the most frequent remarks indicated that the signals could be heard outdoors, but that traffic and human noises tended to interfere with good audibility.

TABLE VIII.—*Comments on the audibility of the signals*

Comment	Comments pertained to self	Comments pertained to others
Audibility would depend on being outdoors	6	6
Noises of people and traffic interfered with audibility	8	2
Near siren that did not go off	4	2
Was listening for signal	3	1
Was indoors	1	2
Audibility would depend on absence of noises	1	1

Recognition of signals

The great bulk of police comments referred to their observations of public confusion regarding the warning signals. Such comments were evoked by a question on the report forms which read: "Were you approached by citiens requesting information? If so, what types of questions were asked?"

Table IX indicates that the questions most frequently asked by the public demonstrated that people did not know what the signals were all about for the most part. These comments were classified as: "evidence of general confusion—pertaining to others."

TABLE IX.—*Recognition of signals*

Comment (pertains to public):	Number [1]
Evidence of general confusion over meaning of the signals	55
Cite evidence of public comprehension of the signals	15
Could not distinguish the "alert" from the "Take cover"	9
Warning signals were confused with other types of signals	3
Evidence of noncompliance with signals	2
Total number	83
Further comments by the police officers:	
Praised District of Columbia civil defense	1
Indicated that respondents felt the test showed that survival under actual attack would be very difficult	3
Suggested that warning systems of other localities be adopted in Washington, D. C.	1

[1] More than 1 comment was made by 1 officer.

III. WARDENS' COMMENTS

Twenty-five warden reports contained comments. As in the case of the newspaper readers, comments tended to come from individuals who heard the test signals faintly (table X).

TABLE X.—*Audibility of signals by wardens making comments*

Audibility	"Alert"	"Take cover"
Loud	10	9
Faint	14	13
Not heard	1	3
Total	25	25

Unlike the newspaper readers' responses, warden comments contained observations of other people's reactions along with those of their own. Thus, 13 comments on audibility pertained to the reactions of others, while 9 were related to the wardens themselves.

The most frequent comment on audibility suggested that noises interfered with audibility (table XI).

TABLE XI.—*Comments on audibility of warning signals*

Comment	Comments pertained to self	Comments pertained to others
Noises interfered	4	6
Were indoors	2	3
Were waiting for signals	1	2
Hearing impediment		1
Asleep		1
In part of building where sound does not penetrate easily	1	
Near siren that did not go off	1	
Was very close to signal, therefore heard it clearly		1

Recognition of signals

With regard to whether the signals were recognized, the run of the wardens' comments indicated that they observed a good deal of confusion among the public.

TABLE XII.—*Recognition of signals*

Comment (pertains to others):	*Number*
Cite evidence of general confusion over meaning of the signals	17
Warning signals confused with other signals	2
Cite evidence of comprehension of the signals	2
Cite evidence of noncompliance	1
Total number	25

Suggestions for improving the warning system

Ten wardens offered their suggestions for improving the warning system in Washington. They were:

Make present signals louder	4
Place signals closer to respondents' home or place of work	2
Make signals unique	2
Put up additional signals	1
Sound signals for longer periods	1

Comments on civil defense

Included in the remarks of the wardens were comments on the local civil-defense organization. As table XIII indicates, these comments were of a generally critical nature.

TABLE XIII.—*Comments pertaining to District of Columbia civil defense and warden service*

Comment	Comments pertain to District of Columbia civil defense	Comments pertain to warden service
Criticism of personnel	3	1
Criticism of attempts to inform public	3	
Criticism of the way in which test alerts are conducted	2	1
Criticism of lack of contact with voluntary personnel	1	2
Criticism of the agency generally	1	
Criticism of equipment		1
General praise of the agency	1	1

Further comments

On the evacuation exercise, two wardens referred to special problems that were encountered. One warden cited the evacuation procedure in one public school as being exemplary.

A further remark by one warden recommended that future alert tests be conducted without prior announcement.

EXHIBIT 3

CHAPTER III. A NATIONAL WARNING SYSTEM

"The need for an effective system of civil defense is surely beyond dispute."—SIR WINSTON CHURCHILL, March 1, 1955

Unless people are properly warned of an impending attack, civil defense is merely a pick-up-the-pieces operation, for no one can take any defensive action without some warning. Therefore the installation of a system whose objective is to alert substantially everyone in the country within a few minutes (perhaps five) is the prime responsibility of civil defense. If people do not wish to act on the warning that is their own business, but they must be given the chance.

Already the United States has many billions of dollars invested in the installation and operation of great early-warning outposts and construction is still going on; this develops a capability of early detection of enemy raiders both in the air and in the sea. The Pine-tree line, the mid-Canada line and especially the DEW (distant early warning) line are becoming well known to the public; so are the Texas tower radar outposts; the Lockheed "pregnant goose" picket aircraft that fly endless patrols over the ocean; and the sprawling submarine detection devices on the ocean floor. We believe that these expensive and elaborate installations are essential to the defense of our country and do not hesitate to spend whatever number of billions is required.

This is a military alerting system. When warning is received our planes, missiles, and destroyers will dash out to do battle with the enemy and, we hope, destroy them. However, if we accept the testimony of military men that there is no absolute military defense—either now or envisioned—we had better think about what happens next.

To relay the warning received through the multibillion dollar military net to the poor taxpayers who footed the bill, all civil-defense organizations together have spent a total of about $16 million, a tiny fraction of what has been spent on the military system.

Except for a very few specific areas, the present public warning facilities are unreliable and incomplete even in target areas; beyond the fringes of obvious targets warning is almost unknown. Even within the District of Columbia, which is the heart of the target complex of Washington, a recent test[1] indicated that under optimum conditions less than 60 percent of the people would be alerted.

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[1] Made 9 months after FCDA's Annual Report for 1954 indicated that the District had 100 percent of the protection required.

There is, therefore, an urgent need for the development of the capability to pass along to the people the warning which is so expensively obtained from our military warning system.

Warning time is defined as the period between the time when a person realizes he must take action and the weapons' effects reach him. Any warning, even of a few moments or minutes, is a great deal better than none at all and generally speaking the chances of any individual improve as the warning time increases. Plans for protective action are tied to probable minimum warning time, and since this time is continually changing it is evident that plans must change too. Within limits these changes are predictable and planning must be farsighted enough to anticipate these probable changes.

There are many stages and grades of warning. These range from very long-range warning with low urgency, such as is given in a book like this, to the flash of a bomb in the sky, which has extreme urgency. Before examining in detail the problem of transmitting the military warning to the public it may be well to consider four other kinds of warning which may have some effect on defensive action: handwriting on the wall, strategic warning, news of nuclear explosions elsewhere, and a flash in the sky.

The handwriting on the wall

Simply because we live in an age whose technology has produced large nuclear weapons and the means of delivering them to targets thousands of miles away at supersonic speeds, we are in constant danger. All who do not believe that the world has already reached the utopian plateau of no more war—either because man has advanced socially beyond that stage or because weapons are so terrible that no one dare start a war—are thus already warned. This is whimsically called the handwriting on the wall. The reasoning goes like this: There is a probability that sooner or later there will be another war. When it happens, events will move too rapidly for many people to take very satisfactory protective action, therefore the best thing to do is to simply live as far as practicable from any obvious target. This might be called individual dispersal. It is a very satisfactory solution for those who find it practicable and many people (but a tiny percentage) have already done just that. Unfortunately more immediate considerations such as nearness to place of work are usually overriding. In those people who see the handwriting on the wall but do not feel strongly enough to act there is likely to be a vague sense of uneasiness.

Strategic warning

Another grade of warning which is often alluded to by various Government organizations is strategic warning. Although the enemy is expected to take maximum advantage of the element of surprise, one theory holds that strategic warning may come in either of two ways:

1. As a result of an enemy buildup in apparent preparation for war—a secret or perhaps open mobilization of the men and materials that would be required to make a large-scale surprise attack on this country. (It is supposed or hoped that our international intelligence system will detect such preparations and relay the information to Washington.)

2. As a result of a general rise in international tension, in which a number of apparently independent disturbances might be presumed part of some master plot leading to a major war.

Although stategic warning might give weeks or even months in which to prepare defenses, the problem is now to recognize it. The classic failure of all Europe to utilize the years of strategic warning given by Mein Kampf and the notable failures of our own military to use the "Winds message" [2] or to expect the entry of a huge Chinese army into the Korean war certainly make one suspicious that our luck next time might be no better.

Assuming for the moment that our Government was alerted, as in case one, by means of secret agents abroad, what would it do? Remember there is an extremely small likelihood of getting any certain evidence of a plan to attack. Typical information would be indirect such as increased activity around strategic airbases or atomic depots. Probably the first step would be to put military forces in an increased state of readiness and perhaps make certain diplomatic moves. But what about civilians? Will the executive branch of Government

[2] The "Winds message" was received at the Army communications center in Washington on December 4, 1941 (3 days before Pearl Harbor). It announced that part of the Japanese fleet had sailed toward some objective eastward.

relocate its own employees (and leave the Congress and the Supreme Court behind) as it does on periodic practice exercises? This could scarcely be kept secret and of course is tantamount to announcing that war is expected soon. The resulting clamor for preventive action would make war almost unavoidable. (A sad thing if our intelligence has been mistaken.) A public announcement indicating long-range warning, no matter how it is expressed, would probably aggravate an already difficult situation and would not likely be made.

The utilization of the second type of strategic warning is even more esoteric. Official statments purport to believe that the people, both as individuals and as a population, will instinctively detect a rise in international tension and will take extra precatuions which range from listening more often and attentively to the radio to stocking up on extra food. Civil-defense publications have indicated that a substantial exodus of nonessential persons from cities is expected (leaving the most valuable people in the most dangerous areas). The basis for this belief is not known but historically there is reason to doubt the willingness of any substantial number of families to separate under such circumstances.

However a sort of middle course is open which might be helpful for civilians. If the Government were warned, it might quietly suggest to selected columnists, commentators, and editors that a series of references to the increasing probability of war would be helpful (a United States version of a propaganda machine which is already in use). Pressure could be gradually increased until the desired effect, a spontaneous movement of nonessential people from dangerous areas, took place. Maybe.

News of nuclear explosions elsewhere

The news that nuclear weapons have been burst in anger elsewhere in the country or the world signals that war has begun or is imminent; this is probably the best kind of warning any individual can receive. It is unmistakable (could not possibly be a failure of the warning system) and, though urgent, still gives some time to take action. Such warning would be spread principally by radio and word of mouth. As to what might happen if this were the first news of hostilities received, one can only speculate; probably the chances of that circumstance are small and there are no specific plans for official action.

The situation in which radio news of nuclear explosions elsewhere in the country would be most important is in the period during and immediately after an attack. If persons have complied with the general instructions they will have taken to shelter accompanied by a battery-powered radio. They will probably be out of earshot of the formal warning devices (which may not be operable after an attack anyway) and will reply on the radio for warning of fallout or subsequent attack.

A flash in the sky

The flash of a bomb burst itself, although very much a last-ditch warning, will be sufficient to make a difference between life and death or injury and safety to great numbers of people; if they know what to do and react rapidly enough.

The flash of a bursting bomb travels with the speed of light (186,000 miles per second) and consequently outruns the pressure or blast wave which travels at the speed of sound (1,100 feet per second in air). Therefore it is possible to use the flash to avoid subsequent effects and this is the basis of civil defense's traditional "duck and cover" instructions. That is not quite the whole story however, for a bomb flash is considerably more than a burst of light. Persons as far as 15 miles away from a 10 MT bomb who are in the open and facing the flash may be permanently blinded and/or badly burned in the first few tenths of a second (depending on the weather). Many cases of temporary blindness of persons at considerable distances or of those who turn to look at the burst can be expected. Those closer than 5 miles may be roasted or even volatalized.

However, people who are facing away, who are partly protected by buildings, or who are indoors and suddenly become aware of a great light in the sky (at night it would seem like daylight) are instantly and urgently warned.

After the first flash the fireball develops, rises, and eventually disappears; lasting many seconds and radiating considerable heat all the time. A quick-witted person can certainly protect himself from much of this heat radiation by ducking into any shadow. Later the blast wave will arrive, moving at the rate of a mile every 5 seconds. (Takes about a minute to travel 12 miles.) The effect of blast pressure is to throw things around including fragments of window

glass (a major cause of casualties in Hiroshima) and since flying glass may be a hazard as far as 50 miles (also depending on atmospheric conditions) there may be ample time to get away from windows and/or reach shelter.

From a great distance (50 to 200 miles) the burst will be evident, at least to persons who are awake, and they should prepare to take cover on the assumption that they may be in a fallout area.

Extension of the military system

Notwithstanding these special circumstances it is generally believed that the best and most efficient means of warning the public would be to extend the military warning to civilians. This, of course, is the basis on which the civil-defense authorities have proceeded; however, their efforts to date have not succeeded in producing anything like a warning system which will be adequate in the rapidly approaching era of ICBMs.

The old concept of warning only those who live near the centers of so-called target areas is not acceptable. Initial weapons effects can reach out 75 miles and fallout can go many times that far; bombs in aircraft which are brought down by our defenses may explode and missiles from submarines or other continents may go wild and miss their targets by many miles.

In other words, though persons in the densely populated centers of obviously attractive targets are in greatest danger, there is clearly a need for a capability of warning people in nontarget and rural areas, too. A reasonable goal to aim for is the ability to warn 95 percent of the United States population within 5 minutes. The value of the lives of the unwarned 5 percent (8.5 million people) is appreciated but the difficulty and cost of reaching the last few percent, most of whom will be in the least dangerous areas, may be prohibitive.

The warning time against enemy aircraft is now an hour or more and is steadily increasing so it is reasonable to assume that even though there is no direct warning to many people they would be alerted in many secondary ways.[3] For example, increased traffic and street noise or the fact that radios and TVs are not operating or the arrival of children sent home from school would alert many people. This can hardly be considered satisfactory but it will certainly help—as long as warning time is a matter of hours.

It is perfectly evident that when warning time drops to a matter of minutes, as it probably will by the mid-1960's, such secondary warning is of little help. By that time the United States should have in effect a widespread alerting system. Such a system cannot be built overnight; it will require careful planning and possibly years of manufacturing and installation. Consequently, we cannot wait until the threat of a few minutes warning time is upon us to start to work. The warning system must be ready when the missiles are ready.

Having agreed that nearly everybody needs to be warned, the problem becomes: What is the optimum[4] way to passing the military warning along? In keeping with our basic assumption that no one solution will be good everywhere, it is obviously necessary to develop a system which utilizes various combinations of many techniques which are available.

For densely populated areas it is quite likely that outdoor sonic devices (sirens, horns, etc.) which are already in use are the best means of alerting the public to danger. In sparsely populated areas, outdoor noisemakers are decidedly not the most efficient means of warning. So other means of passing the warning must be considered which can be used in combination with and in addition to the sirens.

Questions

Before plunging into the examination of specific methods and devices, some fundamental questions must be answered—or at least thought over. Where are people? What are they doing? What do you want them to do when they are alerted?

Starting with the last question let us examine the nature of a warning signal. An alert signal is of tremendous value and yet it contains very little information in itself. This means that the public must be instructed in advance about what to do. Even the simple requirement that the public distinguish betweeen

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[3] A remarkable example of inadvertent warning was the fact that the Chicago police received the warning of the May 5 false alert before the military people did. This happened because their radio contact with the Los Angeles Police Department was abruptly cut off with the remark that there was an alert on. (Los Angeles got its warning from the Western Air Defense Force.)

[4] Best compromise of engineering and economic factors.

two signals may be too much to expect (FCDA's annual report for 1954 shows that only 9 percent of the people in areas where warning existed were able to recognize both signals). Table 1 shows the meaning of the warning signals as of January 1, 1956. The author does not believe that this complexity is necessary or acceptable. To insure reliability a warning must mean one simple thing and be easily recognizable; that meaning should allow the civil-defense authorities some flexibility so that details of the public response do not have to be changed.

The alerting signal should be regarded as just that; it should alert or place on guard. It sticks a pin into the collective rear-end of the public which brings them to their feet ready to act night or day; at home or at work. Thus aroused, they should be instructed (for example) to turn on the radio and get previously prepared instructions and detailed information about what is going on and what is expected of them. This would be a practical way of avoiding last-minute confusion. In the day of the ICBE, a more proper reaction would be to dive in a shelter first and then turn on the radio.

No attempt will be made now to answer these questions with detailed statistics but a few reminders of the knotty problems that arise are in order.

Where are the people and what are they doing? Well, from 11 p. m. to 7 a. m. the majority[5] are at home asleep and their radios are turned off. This means that somehow they must be aroused (probably by a sound equivalent to an alarm clock) and informed. During the hours of 8 a. m. to 6 p. m. families are spread out between work, home, and school. This is the easiest time to pass the warning and the most difficult to take action. By the way, the mental picture of a daytime alert in a crowded downtown city area can be misleading since cities are at their peak population only one quarter of the time. The remaining part of the day and weekends families are likely to be traveling or entertaining themselves; mostly they will be together and can take action as a unit—if they are alerted. In planning a system one must evaluate means of reaching people in all these circumstances plus the time they are in movies, stores, churches, and on the highway. As for their immediate surroundings, it must be remembered that in buildings which are tightly closed (for heating or air-conditioning) or in very noisy areas siren-type devices cannot be heard.

How do you get people to accept the signal as a warning? Warning given by sirens can be confused with fire, ambulance, and police sirens. (In some cities fire sirens are sounded as part of the alerting procedure.) Where sirens are repeatedly heard, the brain may selectively sort out and reject all siren-like noises. One solution is the use of unmistakable sounds in which the frequency, the duration or the undulations are not at all like any other noise. Another is the duplication of signals. For example: When an interior device sounds in a place of business (if no radio is readily available) an employee might raise a window and listen carefully for sirens which would be loud enough to give confirmation but not to give primary warning.

How often do you test the warning system and what should a test consist of? The principal object of a test is to assure reliability (so the system will work when it's needed) but it has the added advantage of familiarizing the public with its sound. Some sirens can be given a "growl" test. This means they are started to make sure they are working but not allowed to run long enough to get up to speed and make a loud noise—they merely growl. Other devices, including most indoor devices, cannot be tested that way since they work on an all-or-nothing basis. The ideas about how often to test range from once a day to once a year with weekly or monthly tests finding the greatest favor. If the alert is sounded too often civil defense is in the position of the boy who cried, "Wolf"—no one will pay attention; if too rarely it may not be operable or be recognized. Somehow an appropriate balance must be struck—possibly by testing on the first day of each month so that in the course of a year the warning would be tested on each day of the week. This would be a good reason for periodic publicity which would necessarily accompany the tests.

Already the situation is such that on a "real" alert[6] operators simply doubted

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[5] In the United States 96.4 percent of the population live in households with an average occupancy of 3.28 members (remainder live in institutions, boarding houses, hotels, etc.)

[6] On May 5, 1955, a flight of United States strategic bombers from a base in Kansas flew a practice mission which took them through Central Air Defense Force territory to northern Canada and brought them within (unexpected) range of the Distant Early warning line radars. DEW reported this to Canada and the Western Air Defense Force. The failure of a decoding device delayed the passage of messages which identified these planes as friendly and an alert signal was sounded in several west coast cities where interesting snafus developed. For all practice purposes this was a real alert.

the accuracy of the signal; they thought it was a mistake or a short circuit.

Types of devices

Warning methods can be put into two general classes: (1) Public outdoor devices which indiscriminately reach as many people as possible and (2) indoor devices which alert specific households, institutions, or business establishments. They are quite different in operation but each has its place and they do not necessarily exclude each other. In many places it will be desirable to have overlap of the two methods to insure adequate warning.

Consider the means by which the public could be alerted and the facilities which are existent or can reasonably be constructed. There seems to be little use in having a warning which appeals to the senses of taste, touch, or smell, but, even so, suggestions have been made that a distinctive odor be released in large quantities or that a small artificial earthquake might be generated. Visual warnings, without accompanying sound, are probably not of much value. This leaves the field wide open to devices which make noises or use some combination of sound and sight. Table 2 lists most of the ideas and machines that have been suggested. Undoubtedly there are others.

Criteria[7]

Some standards of use and performance must be established at the outset which can be applied to each system and system component in turn so that their merits and deficiencies can be compared. These apply to exterior and/or interior systems.

1. Number of people that can be warned directly by a system is the prime criteria; generally the more people that are warned the better. The number of people alerted by any device will vary considerably with the time of day, the day of the week, the season of the year, etc., so any device or system which overrides these variations and is constantly useful is preferable.

2. The cost of any device is important relative to the other devices which will do approximately the same job. Total cost of the system is discussed later.

3. The likelihood of false alarm, given either by an individual device or by the system, must be considreed. Probably one a year would be tolerable; one a month would be intolerable. (Frequent false signals from individual warning horns in Washington, D. C., have caused considerable resentment.) A false alarm by a large piece of the system (in which signal is apparently confirmed by neighboring devices) is a much more serious business.

4. Reliability (the opposite of the false alarm) means that the system will work whenever it is supposed to. Obviously, 100 percent reliability is desirable, but an occasional failure of the receiver (siren or interior device) may be permissible. However, the transmitter in the Civil Defense Headquarters or central station which sends out the signal must be made 100 percent reliable. Periodic tests are needed to insure reliability.

5. Acceptability by the public may be a determining factor. Devices which seem to favor social or political groups, or which are very irritating when tested, are likely to be unacceptable. Interior warning devices which are bulky or hum would probably not be kept operating very long.

6. The number of kinds of signals that can be sent will be important if it is deemed necessary to have several kinds of alert. (The author does not believe that more than one is necessary.) Sirens are now used for 2 signals; the bell and light system for 4.

7. Interference with other systems, particularly by some of the proposed interior warning devices, might be unacceptable to the public or might actually endanger other parts of the war effort. For example, (1) devices attached to the electric power or telephone systems should not interfere with their usual peacetime use; (2) the testing of systems should not interfere with presently installed systems; (3) during an actual attack the alarm system must not interfere with the power and telephone systems at a time when the need for continuous operation is imperative.

8. The time to activate the warning device or system must be as short as possible, certainly less than 5 minutes. This requirement, which is not so acute at present, is absolutely essential in the day of the ICBM, when a few minutes may be a large percentage of the total warning time.

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[7] This section and those dealing with indoor devices has drawn heavily on the University of Michigan report to NAS–NRC on indoor warning.

9. Subsequent warning may need to be given, since a war is unlikely to end with a single raid. Although the first warning is of maximum importance, the system should be capable of providing repeated warnings. Any warning which is tied in with the telephone or power systems might be made inoperable by an attack. (This case is most likely to arise near areas that have already been hit and are less likely to experience a second attack.)

10. Continuous alarm feature. It may be desirable to have an interior device which sounds and lights up continuously until it is turned off (so as to awaken a heavy sleeper). One disadvantage is that on a test, if the householder were not at home, the continuous sound might annoy the neighbors.

11. Foolproofness is certainly a desirable characteristic for any device that the public can get their hands on. Interior warning devices should be made so that they are not only simple in operation but unattractive enough so that the householder or his children will not be encouraged to tamper with them or apply them to some other purpose than that for which they are intended.

12. Duplication of warning in some areas is desirable since it minimizes the danger of false alarms and gives the psychological advantage of definiteness. For example, a building which is air conditioned may be warned by an interior bell system; the occupants could then raise the windows and listen for sirens as a doublecheck.

13. Many people in automobiles will not be reached by any of the present warning devices. During the daytime about 4 million autos are on the road at any one time and although some 60 percent of them are equipped with radios probably not half of these are on. A means of alerting this substantial mobile group would be desirable.

In spite of the limitations that these criteria place on the selection of a suitable warning device, inventors do not seem to have been dismayed and several dozen ideas and devices are available to choose from.

Outdoor warning devices

Among the outdoor noisemakers dozens of kinds of sirens are available in a wide range of makes, horsepowers, and frequencies; there are bells, jet engines, electronic horns (sirenlike sound followed by voice announcement), and modulated compressed-air horns. It has been proposed that antiaircraft guns be fired and even that boiler factories should signal with a "blast of silence."

In the category of outdoor sound-and-sight devices it has been suggested that rockets be fired and that small, clean A-bombs be burst to alert the public.

After applying the criteria to each of these it will be seen that for one or more reasons all are probably unacceptable except the sirenlike systems which blanket an area with warning. Even where sirens or jet engines are at their best used a system of indoor warning devices which supplements and confirms the warning will be desirable. Horns and loudspeakers which give direct voice announcement in addition to the alerting signal may be useful in certain densely populated zones where it would be difficult to comply with the instruction, "Go to a radio at once for information." The fact that a considerable number of outdoor devices have been bought and installed does not necessarily mean that people outdoors are warned. In Washington, D. C., as of October 1, 1955, the sirens had not performed well enough to be accepted and warning horns only worked properly 73 percent of the time.

Indoor warning devices

The existence of sirens and horns for warning people outdoors is common knowledge but the possible means of extending the warning into homes and buildings is less well known so a more detailed explanation is worth while. The most reasonable means of obtaining access to a household for the purpose of alerting people indoors is by means of the radio, telephone, or power systems; the problem is to send a warning signal through these channels within the limits of the above criteria. Telephone and power companies are decidedly cool to the suggestion that their wires be used for such purposes but in discussions to date they have been reluctant to discard the business-as-usual concept or seriously consider any method which impairs their efficiency, even for a few minutes, in an emergency.

Radio devices

Among the first pieces of information to be sent out by an air division control center at the discretion of ADCC is the radio alert which goes to key stations throughout the country at about the same time as the yellow warning. When a key radio station receives this radio alert, normal broadcasting is immediately

discontinued and the station (1) cuts off its carrier wave for 5 seconds, (2) returns to air for 5 seconds, (3) cuts carrier off again for 5 seconds, (4) returns to air and broadcasts 1,000-cycle note for 15 seconds, (5) broadcasts conelrad radio alert message for 1 minute, (6) goes off the air to come up again on conelrad. (See ch. IX.)

All radio stations are required by law to continuously monitor a key station for this signal—which they do automatically with a device that sounds an alarm when the carrier wave is broken in the prescribed manner and followed by a 1,000-cycle note.

A number of leading radio manufacturers have proposed making home receivers which sound an alarm in response to this or to some other suitable code which could be broadcast. There seems to be no simple way of adapting presently owned radios to do this so a new radio may be required; however the possibility of new inventions for this purpose (perhaps one by each manufacturer for his own equipment) should not be overlooked. Such a radio would be like any ordinary radio except that it could not be turned off but only to standby. Turning to standby would set the frequency to continuously monitor some radio station which broadcasts 24 hours a day. In this condition it would give no sound except when the code was transmitted. Then it would make a noise loud enough to arouse the householder who would turn the set on and tune to the appropriate station to receive detailed information about what to do. Transistors instead of tubes would probably be necessary in order to keep the cost of the continuing power use from becoming prohibitive. Sets could be powered by normal houshold sources or by batteries or by both; in the latter cases they could be carried about and used like any portable radio. (The civil-defense advantages would in no way detract from the peacetime value.)

The great advantage of using a radio system of warning is that the alerting device is integral with a means of obtaining detailed information immediately after beng warned. Any alerting method that is devised will require that the public get supplemental information somehow; probably by radio. It would certainly be desirable to have a set in each shelter that is independent of the public power source and can be used to receive civil-defense information.

Costs of such radios are difficult to estimate since they depend on the number of sets to be produced, the cost of transistors (which is steadily dropping) the ownership (cost of merchandising) and the quality of the sound reproduction that the public might want. A figure that can be used for rough calculation is that in lots of 100,000 these radios could be produced for about $25 (exclusive of retail distribution cost); in lots of millions they would be much cheaper.

A detailed study of costs and requirements of the alerting radio is certainly indicated because, aside from the relatively high initial cost, it has practically no disadvantages. Perhaps some financing plan in which the cost would be heavily subsidized by the Government would be effective in encouraging the public to use them.

Telephone devices

The fact that telephone lines enter so many homes and are already able to ring a bell there has caused the suggestion to be made thousands of times that the telephone system be used to give warning. Aside from the fact that only 69 percent of the people of the United States (mostly the wealthier class) can be reached by phone there are other good reasons why the telephone system is not as easy to use as it appears at first glance.

When the telephone bell rings, even though a special code is used, the householder can be expected to pick it up and answer it. Thus the ringing of any important fraction of the telephone bells at once (which is not now possible because of lack of ringing capacity at the exchanges) would be a sure way to jam the telephone system without producing any useful result. To make certain that the bell coding is understood it has been suggested that a recorded announcement of an alert might be played when the phone is answered. This also would require very substantial additions to the present equipment.

It might be possible to put a different sort of noisemaker in the telephone set which would be unmistakably an alerting signal; this would require the installation of an additional wire to every set plus extensive additions in the exchanges.

The difficulty with using the telephone system can be summed up by saying that it has been carefully designed for person-to-person communication between a small fraction of the subscribers at one time. The attempt to convert it to broadcast a warning would be expensive and might seriously alter its efficiency

both in peacetime and in war—when it is essential that it be able to work at maximum capacity. Despite considerable education to the contrary it is believed that the public will attempt to use telephones anyway on nonessential calls so that some control system will be required to keep the system operating.

The high probability that any public warning will instantly saturate the telephone system means that it is useless to plan on making direct calls to warn key people or pass along important civil-defense information. The telephone companies are less than enthusiastic about the suggestions by outsiders for the use of their equipment, however they have agreed to make cost estimates whenever specific requirements are stated.

This rather pessimistic view does not automatically reject the use of all parts of the telephone system as a means of warning. In some rural areas and in special circumstances the telephone may be the best means of alerting in spite of these difficulties.

Two rather special and expensive auxiliary systems using telephone lines are already in use for alerting key people and installations. These are the "bell-and-light" system and the "conference circuit"; each requires special (additional) "hot" wires. "Bell-and-light" costs about $75 to install plus $7 per month. It has the advantage of being able to receive four kinds of warning (yellow, red, blue, white) as colors, and make a buzzer sound too. The receivers are generally installed at central points in large buildings, such as a switchboard or guard office, from which point the general building alarm (firebell) can be sounded. The "conference circuit" of nine stations costs about $9 per month per station plus installation and has specialized military and executive uses.

Power line devices

Public power distribution systems have the advantage of reaching a very large fraction of the population including practically everyone within target areas. Because there is plenty of power available to sound an alert and because the service is so uniform (60 cycle AC almost everywhere) there are a number of ways of using the power system which seem to be technically feasible. The two most promising proposals to appear so far are for shifting the normal (60 cycle) frequency slightly and for sending a coded audio frequency signal over the transmission lines. In either case a small home receiver plugged into an ordinary electric outlet would be triggered and buzz noisily to sound the alarm. The following brief descriptions may be of interest to those who are interested in technical details.

• The frequency shift method, which is reinvented periodically, has been successfully tested in small numbers in Los Angeles and is actually in use at Los Alamos, N. Mex. It consists basically of a tuned reed with a natural frequency of below 58 or above 62 cycles per second which is arranged to vibrate in response to an appropriate shift in frequency of the power system. (Power failures resulting in a rise of frequency above 62 cycles are almost unknown so a change upward in the frequency seems to be best.) The vibration can be used to release a relay which sets off an alarm or to directly sound a bell. The device is so simple that it can undoubtedly be mass produced for $2 to $5; installed it would draw 10 watts of current continuously (about $2 a year).

So, the part of the system in the home is inexpensive and acceptable on all counts; it has the virtue of being so reliable that few tests would be necessary, and of very little likelihood of a false alarm.

The difficulty lies at the transmitting end. Although no special equipment for sending the signal is needed, in much of the country it is not a simple matter to change the frequency. The change to 62 cycles requires about 7 percent more power, however most generator plants can stand such a load if the rise takes place over a minute. A much more difficult problem arises because of the extensive interconnection of the many power systems. The Michigan power system, for example, is connected with the systems in New York and New England (altogether 27 million kilowatts or one-fourth of the total for the country is operating as a single synchronized system.)

It does not seem possible that the frequency of so vast a system which is controlled from so many locations could be changed fast enough to give warning. Apparently the only possibility would be to open the interconnections between generator plants (in itself a difficult process since loads would have to be removed or balanced) and regulate systems individually. In either case a special communication system would probably be required to alert the men who could make the changes. More isolated systems such as that in the Los Angeles area which

receives the bulk of its power from Hoover Dam could probably be used without serious modification.

Carrier systems use coded audiofrequency signals transmitted over power transmission lines to set off various sorts of home-warning devices. Four specific proposals are for the use of frequencies of 540 cycles, 720 cycles, 3 to 6 kilocycles, and 8 to 24 kilocycles. Each requires control lines to central stations, auxiliary equipment at the power stations to convert or generate audio power, and the installation of the device in the home. Generally for the higher frequencies the central installation costs more and the home devices less; for the lower frequencies the reverse is true.

Carrier systems such as these are practical, at least in small-scale operations, as has been repeatedly demonstrated. The 720-cycle system is equivalent to one that has been in use for years by the General Electric Co. as a means of turning street lights and water heaters off and on; the 3- to 6-kilocycle system is used by International Business Machines in 7,000 installation to set clocks, control lights, and do similar jobs.

It is not certain that a large-scale carrier system could be made to work satisfactorily in a highly complex metropolitan area power-distribution system. However, for suburban and rural areas or as a partial supplemental system it is believed that a carrier system could be made noninterfering and reliable. Proper design of the components would allow different types of alarm or continuous alarm. Cost of the carrier system for the low-frequency signals would be approximately $6,000 per substation plus $12 per receiver plus $2 per year for power. For the higher frequencies the cost per substation might be $25,000 plus $5 per receiver with negligible power. Using a figure of 5,000 households per substation for estimating purposes, the cost per household would be $10 to $15 plus the cost of the control lines which would activate the substation equipment plus the power used.

A subharmonic method calls for the modulation on the 60-cycle powerline of a 30-cycle carrier to the extent of 2 percent by shorting out the present power supply every other cycle. Ignitrons in the generating stations would be used to shift heavy resistive loads in and out at 30 cycles per second—or perhaps saturable reactors would be used. A resonant relay with an alarm attached could be used in the home as an alarm; an additional warning would be given by flourescent lights which would flicker noticeably at 30 cycles per second. All the problems of making such an installation have not been worked out but it has been estimated that the cost per household would be $12 to $15.

A voltage drop method of triggering interior warning devices has been suggested which requires the momentary interruption of one conductor of a three-phase system. It is said that a similar method has been used in Germany for remote controls. This interruption, after passing through various transformers, appears as a voltage drop in each household. The probability of false alarms is very high and the cost would be equal to or greater than that of the carrier system. Reliability could be built into the receiver by using some complex code which would require more expensive transmitters and receivers. A fault to ground at the same time as a test signal might have serious consequences. This scheme is not regarded as promising.

To these proposals the electric power industry through the Edison Electric Institute [8] has replied that "there could be no assurance whatever that alarms could be sounded quickly and reliably by means of frequency change when the need arises," and that it would be "completely impractical to burden their operations in times of emergency with any alarm system which would require difficult if not impossible procedures."

They also point out that the events which immediately follow the sounding of an alarm require unfaltering power which may not be possible if interconnections are disrupted and they cite the need for power to operate radios (transmitters and receivers), trains, elevators, gasoline pumps, and traffic lights.

As with the proposals for the use of radio and telephone systems, the last word has not yet been said. In some regions which are relatively isolated powerwise, the power system may be a very promising pathway for a warning signal.

Human problems of the warning net

Another important piece of the warning net which exists but needs substantial improvement is the linkage through which the warning signal flows from the

[8] Statement of the Edison Electric Institute, May 19, 1955, by A. S. Griswold, F. D. Campbell, C. E. Fishbeck, and E. D. Glatzel.

air defense control center to the last transmitting device. In other words, if a complete system of both exterior and interior devices was installed and operating could we be certain that the signal would be sounded? The question is not as silly as it sounds when the existing situation is examined closely—as it has been in Washington, D. C., and San Francisco, Calif. Most of the difficulties are human rather than mechanical.

For example, air defense control centers do not have enough CD employees to staff the CD warning net full time. At some centers 1 CD man works a 40-hour week and the other three-fourths of the time CD duties are performed by whatever military personnel happen to be present. This has led to disagreements about responsibility which need to be formally resolved.

Men in key positions who are charged with maintaining the circuits, observing the test signals, and sounding the public warning may not believe the alert signal. Since no attack has ever followed a signal they are being conditioned to believe there is no relationship. Their reaction is most likely to be, "Something is wrong with the circuits or someone is kidding me." A remarkable percentage of such people do not beleve there will be a war and may be governed accordingly.

Some personnel with the responsible job of receiving the signal from ADCC and passing it along have not been thoroughly informed and instructed about their duties and responsibilities. In Washington, directors, dispatchers, and switchboard operators were found to have different or vague ideas about what to do under various possible circumstances.

Some civil defense communications center employees have been found to be so disgusted with the local policy that they have stated they might leave their posts in an alert and one is quoted as saying, "I don't see any reason to follow (constantly changing) instructions." In Washington no provision whatsoever has been made for sheltering the persons who are expected to stay and operate the warning, communications, or conelrad systems. Who could blame them for leaving?

Dispatchers (operate the siren system) have been "rattled" by unexpected warning and have actually forgotten their instructions. Others are afraid of punishment for sounding a false alarm and may try to verify the alert message in several ways (although that may not be part of their instructions).

In some areas the responsibility for ordering a public warning is vested only in the mayor or the CD director. If these men cannot be located (which, at best, may be time-consuming) there is no provision for sounding a warning at all.

Many other examples of possible human failures could be given; some would only slow down the signal, others would stop it altogether. Some of the humans can be replaced by automatic devices; others will have to be properly informed or trained, or perhaps replaced. The passage of the signal from its inception until it actually reaches the public must be minutely examined for human flaws which might fail under an emergency and render useless all the other measures that have been taken.

A set of clear instructions based on predecisions by top-level people is needed so that there will be no need for finding someone or making a decision at the last minute.

A system is needed

By this time it is undoubtedly apparent to the reader that (1) something had better be done to provide satisfactory warning, (2) the solution is not a simple one. The careful selection and installation of many components to form a coherent system is required.

The present collection of outdoor sonic warning devices which are scattered about many cities does not constitute a warning system except in the most limited sense of the word even though the devices perform exactly as is claimed. Few cities even know what their warning capabilities are in terms of (1) reaching the public with a sufficiently audible signal, (2) the acceptance of that signal as an attack warning by the people who hear it, and (3) public knowledge about what to do after recognition.

Thus the percentage who are effectively warned is debatable but it obviously varies greatly with the time of day or night, the day of the week, the season of the year, the weather and the individual's location. And note the qualification, "outdoor." Some civil defense groups apparently feel that by warning those who are outdoors they have discharged their responsibility.

The problem therefore is to determine exactly how the warning system should be made more reliable and extended to a much larger percentage of the American people. There are three principal subproblems:

A. The extension and improvement of the main lines of the warning net (so that ADCC can directly contact more local points) with special attention being given to increasing the reliability. This would include making circuits more secure (especially for use after the first attack) and more automatic (reducing the chance of human failure).

B. The extension of facilities for actually warning individuals by increasing the outdoor warning capabilities and adding an indoor warning capability. The sum of these two will be the alerting system.

C. The education of the public so that they are well aware that some single simple action is expected of them when they are alerted.

No one, repeat, no one, can say offhand which is the best combination of indoor and outdoor warning devices that are described here. A study must be made by some technically competent research group which can apply modern operations research (systems analysis) techniques to the problem and recommend a complete plan of action based on scientific assessment.

The research group selected should be charged with the comprehensive problem: How do you alert the people of the United States and no limitations put on them about cost, ownership, or justification (at least not until a first plan has been proposed which is best from the purely technical-sociological point of view)? A group of first-class researchers will certainly keep these important factors in mind from the very beginning but they should not be restricted. Such a study should atempt to determine:

1. The present alerting capability (realiability and number of people warned in various circumstances).
2. A plan for extending and simplifying the main warning lines (item A above).
3. Means of eliminating the necessity for human decision and action.
4. Where and with what specific equipment is it best to use outdoor devices (with cost figures).
5. Where and with what specific equipment is it best to use indoor devices (with cost figures).
6. Where there should be overlap and what priorities should be assigned to the actual implementation.
7. How the system could best be financed and encouraged.
8. How the system should be installed and operated.
9. An educational program so that the warning is understood and utilized by the public.

A system analysis which at least includes these items must be made if the United States is ever to get a reliable warning system. There are no shortcuts.

By painstakingly examining each of the many possible plans with an unprejudiced eye and assigning numbers to the various advantages and disadvantages of each, totals called figures of merit can be obtained. When all factors have been properly evaluated the highest figure represents the best system.

The advantage of scientific analysis (often using computing machines) is that it is free of political pressures and can automatically select a specific system without bias. This is the method used in devising military weapons systems and in selecting radar units and locations for the distant early warning line. These military measures have been supported almost wthout question by the Congress because it had confidence that the research groups (mostly outside the Government) which devised the plans had carefully thought through the problem and come up with the best possible solution. Civil defense plans made in this methodical way will also receive support.

Cost

It literally may be worth your life to be warned—and that is quite a sum—but how does one estimate the probable cost and determine who pays for it? Firm figures can only come from a systems study but a rough approximation can be readily calculated. In fact, since no responsible engineer has yet ex-

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[9] The present program of the FCDA consists largely of testing and approving for purchase various pieces of warning equipment under the "matching funds program." If a city wishes to buy sirens the FCDA will pay half the cost if any of the many types that have been approved are used. This procedure cannot result in the development of the necessary system and if it were to be extended to the interior devices a ridiculous situation could result. Suppose that three devices were approved which utilized the power system and Washington, Baltimore, Philadelphia, New York, and Boston, whose power systems are interconnected, did not all decide on the same one (they don't have the same kind of sirens). There would be more than one kind of transmitter in some stations, complex instructions to personnel, and still no guaranty of warning to suburban and rural areas.

pressed doubt that a warning system which reaches 95 percent of the people is technically feasible, the problem is essentially one of cost and responsibility. In determining whether the final figure is acceptable, the need and cost of warning for civilians must be compared with that of the DEW Line—not with the present effort.

Approximately 87 million people live in FCDA's target areas and 80 million in the remainder of the country (2.6 million and 2.4 million households, respectively). By extending the present siren coverage in the target areas and maintaining the bell-and-light systems for special public buildings, people outdoors and some people indoors can be warned. Including upkeep and charges for 5 years sirens cost about 100 cents per person; the bell-and-light system costs about the same (when used in large public buildings as in Washington, D. C., where it is connected to the building warning system) so the cost of warning most people in target cities will be on the order of $90 million. These signals will not satisfactorily reach everyone so an additional 3 million interior devices will be needed to reach certain small businesses, offices, and some households (with intentional overlap). If a radio system were used (few offices have radios and would need them for supplemental data anyway) the cost (5-year basis) would be about $50 per unit (50 cents per person for 100 employees, $15 per person in average household). Other interior devices might cost one-half of that sum but since access to a radio would be necessary we will use a figure of 150 million for radios. The total for reaching people in target areas is then $240 million.

Outside target areas we will make the assumption, for the purpose of this calculation, that interior devices costing $20 each (for 5 years) will be needed. Actually many small cities, towns, and villages can efficiently use outdoor devices which cost much less. The 80 million people are distributed among 24 million households which would require $480 million worth of warning.

So for a rough approximation which is undoubtedly on the safe side, we have $700 million as the cost of a warning system for 5 years or about 80 cents per person per year. Careful engineering and amortization over 10 years or more, would probably halve that figure. Other motives and means might be utilized to cut the direct cost to the Government. For example: It may be desirable to buy back some of the existing equipment and junk it or reassign it to more efficient use. Private companies such as radio manufacturers may see the chance of a profit in selling some items directly to the public. Taxes might be levied on all radios without warning devices.

By way of comparison SAGE (semiautomatic ground environment) system, which is to be built by the military in the next few years as an additional means of keeping track of enemy aircraft is estimated to cost $5 billion or roughly 7 times the cost of a public warning system. The public has scarcely heard of SAGE (Is it apathetic?) and the Congress was barely consulted on the matter (after the decision to build it was made the Defense Department was requested to get the "express approval" of Congress as soon as possible).

Sure, $140 million a year is a huge sum, but so is any number that is obtained by multiplying a small cost by 168 million Americans. The question is, "Can the United States afford not to buy this essential item?"

Responsibility

In the matter of seeing that the public is properly warned, more than in any other aspect of CD, it is clear that the responsibility belongs to the Federal Government. The present public law requires that "* * * appropriate provision * * *" be made "for the dissemination of warnings to the civilian population * * *" and it should be satisfied.

A warning system must be planned with Federal sponsorship and it must be as disdainful of local political boundaries as are the effects of the weapons we face.

The procurement and installation of equipment should be done with Federal funds.

The operation and testing should be carried out under Federal supervision.

Then the United States will have a warning system.

TABLE I

There are three classes of warning:

(1) *Air defense warnings.*—From Air Defense Command centers to CD headquarters and keypoints:

Yellow: Attack by hostile aircraft is probable.

Red: Attack by hostile aircraft is imminent.
White: Attack by hostile aircraft is improbable.
(All three may be accompanied by other intelligence.)

(2) *Civil defense warnings.*—From civil defense headquarters to local groups, service groups and some CD officials—(distributed in this form by the bell-and-light system):

Yellow: Civil defense readiness; attack by hostile aircraft possible. "Will be disseminated only to agencies and personnel designated by the CD Director to receive same. Under no circumstances will a public announcement be made."
Blue: Prepare to evacuate; attack by hostile aircraft probable.
Red: Take cover; attack by hostile aircraft is imminent.
(Transmitted to the public in the form shown below.)
White: Hostile aircraft have left the area; CD personnel come out and survey the situation. (May be transmitted by Conelrad to those CD workers who are not available by bell-and-light.)

(3) *Public warnings.*—From local CD headquarters to the public. (Only signals disseminated to the general public—no color designation.):

Take cover signal: Attack by hostile aircraft imminent; take cover (undulating tone or short blasts on sirens for 3 minutes).
Alert (evacuation) signal: Attack by hostile aircraft probable; evacuate sirens sound steady tone for 3 to 5 minutes).
All clear: Not exactly a signal in the usual sense but instructions to CD workers, monitors and the general public are to be announced over Conelrad, if it remains workable.

TABLE 2—*Proposed warning devices*

OUTDOOR	INDOOR
Sirens	Power lines:
Jet engines	Frequency shift
Horns (electronic)	Carrier system
Horns (compressed air)	Voltage drop
Horns (aircraft carried)	Subharmonic
Whistles	Voltage spike
Bells	Signal to turn on existing radio
A A guns	Telephone:
A bomb	Bell-and-light systems
	Conference circuit
	Direct call (including party line)
	Ring all phone bells: With a special ring give recorded message
	Use of telephone wires to sound signals other than telephone bell
	Radio AM broadcast band:
	(All AM, FM, and TV goes off the air under present regulations and thus gives a sort of warning)
	Constant monitoring of coded alert
	Induction-field radio
	Use of "Collegiate broadcast system"
	Focused siren
	Water pipes
	Gas pipes

In the entire United States:
96 percent of households have electricity (over 99 percent of these have 60 cycle AC).
94 percent of households have radio.
69 percent of households have telephone.

In target areas (critical target areas have slightly larger percentage):
99 percent of households have electricity.
97 percent of households have radio.
76 percent of households have telephone.
(170,000 people in the United States are totally deaf. 15 million have some hearing impairment.)

EXHIBIT 4

National Academy of Sciences
Advisory Committee on Civil Defense

OPERATION GREEN LIGHT
THE EVACUATION OF PORTLAND, OREG., SEPTEMBER 27, 1955

By Willard Bascom

LAY OF THE LAND

Portland, Oreg., is a city with a population of about 375,000 in an urban area of 700,000. It is separated from the coast by about 80 miles of rugged hills and bounded on the north by the Columbia River. The Willamette River bisects the city in such a manner that the business district, and consequent high daytime population, is on its west side, but about 80 percent of the citizenry live on the east side. Five bridges of four lanes connect the two parts of the city. Weather is generally mild but damp. (Rarely freezes, but rains about 150 days per year.)

WHAT THE TEST WAS SUPPOSED TO DO

Portland has invested considerable money and effort in the preparation of civil-defense plans to make itself ready for a real attack. These plans appeared to be well conceived and workable. For example, plans for day-to-day traffic flow have been made with one eye on the civil-defense problem and a special emergency traffic light system for the express purpose of expediting evacuation has been installed. But having plans and setting up machinery is not enough—they have to be tested.

It would have been easy to plan a modest test which would certainly have worked and would have satisfied casual observers and made the bureau of civil defense look good. But these were not the objectives. As stated by Civil Defense Director Jack Lowe, "The test has to put some load on the plan and force it to break down at its weakest point. It has to be big enough to be significant."

So the test was set up to involve everyone in a 1,000-block area comprising all of the downtown area of Portland and large residential and industrial areas on both sides of the river. The inhabitants were "expected to participate—all vehicles are to be removed from the streets in the test area."

The element of surprise was added in that the test was scheduled for "after 2 p. m. on Tuesday, Wednesday, or Thursday of the week of September 26." There was no public announcement previous to the sounding of the sirens.

An arbitrary perimeter was set up 1 mile outside the boundaries of the test area, and cars were expected to pass check points at that distance before turning aside and/or waiting for the all clear.

The test also was intended to answer some practical questions that other local CD groups has had about staging test evacuations. Questions like, Will the public participate? How do you maintain municipal services (fire, police, utility, hospital) while a test is under way? Will traffic signal lights guide evacuation traffic as well as police and wardens? How do you persuade businessmen to close up shop early and send employees home? And many others.

The test appeared to fulfill its objectives.

PARTICIPATION

1. Weather

The weather participated to a greater extent than had been planned and was less cooperative; it rained fairly hard the entire afternoon. Although this had obvious disadvantages for the participants, these are outweighed in retrospect by the fact that the public cooperated so well in spite of the rain. Rain is a fairly normal circumstance in Portland and a test conducted on a clear day would have left the question hanging of how evacuation would work in inclement weather. Now they know.

Any thought of postponement was discouraged by the weatherman who predicted equally bad weather on succeeding days.

2. News media

Over a period of weeks the test became a matter of civic pride; and press, radio, TV, and newsreels gave wholehearted support. They really wanted the people to know the whole story. Had civil-defense news received only perfunctory coverage with official releases published in the back pages of the papers,

such a successful test could not have been carried out. Instead there were daily stories about the preparations as well as question-and-answer columns, cartoons, poems, maps, and photos. Civil-defense people made numerous appearances on radio and TV to answer questions and explain what was wanted.

During the test the key positions swarmed with reporters taking notes and gathering statistics; there were on-the-spot broadcasts from the streets and from CD headquarters; the newsreel photographers were out in force.

Immediately afterwards the test news forced almost everything else from the front pages of the papers.

Oregon Journal

TEST EVACUATES CITY IN RAIN

Downtown Empty After 19 Minutes

egonian

Sunrise Final

TEST VIOLATOR RISKS ARREST

Chief Calls On Public To Comply

3. Police, fire, utilities

In the words of their chief, Jim Purcell, the police bureau felt that it had most to lose and least to gain of any of the agencies involved in the test. Consequently, they planned with extreme care to protect their reputation ("If anything goes wrong they'll blame it on us.") and had 800 to 1,000 officers on duty.

As the evacuation developed, many police moved out with the evacuees because "demand for police service is proportional to population." To protect the deserted city against criminals who might take advantage of the evacuation, special patrols were instituted and foot detectives were furnished with radio page receivers so they could be contacted quickly. For the possible circumstance of crime coincident with the heavy traffic flow, detectives were mounted on motorcycles (cycle detectives) so they could get around quicky. No crimes were reported however.

Police also performed the services usually associated with evacuation such as turning away incoming vehicles at the outskirts and directing traffic at critical points such as bridge approaches.

They were assisted in this by an ordinance especially passed for the occasion which made it unlawful to disobey any police officer or civil-defense worker who was expediting the evacuation and gave the authority to arrest. No arrests were necessary; apparently the threat carried in headlines by the morning Oregonian, "Test Violator Risks Arrest," was sufficient.

The fire department did not evacuate although in an actual evacuation they plan to move most of their equipment outside of the metropolitan area. It did take extra measures, however, the most interesting of which was that off-duty firemen would report for work as unpaid volunteers to supplement fire protection throughout the test area. The absence of persons likely to report the outbreak of fires caused some worry and persons in offices and stores were warned to make a double check of fire hazards before leaving. Firemen were stationed at many alarm boxes as an extra precaution.

At the height of the traffic movement a man suffered a heart attack and was reached without difficultly by a fire department first-aid vehicle. The chief concluded that fire operations could have been conducted without serious obstruction if they had been required.

The utlity companies were in the somewhat ambiguous position of doing exactly the opposite of what they would do in a real evacuation, in which they would leave town and let the service go. For the test 35 emergency utility vehicles were stationed in advance at strategic points throughout the evacuated area.

4. Economic

When Mayor Fred Peterson decided a test of the civil-defense plan was necessary, he called a meeting of a hundred of the city's prominent men including business leaders. Director Lowe gave them a presentation which contained his estimate of what was likely to be involved in time, effort and money. Plainly the exercise would be expensive.

The first two responses (quite spontaneous) came from the heads of the telephone company and of the city's largest department store. They were strongly in favor of testing the plan, to the point of being mildly critical because a test hadn't been proposed earlier. The pattern was set and opposition from the business community substantially disappeared. Each company made its own plans and carried them out; somehow they made satisfactory arrangements which solved the many problems which have appeared insuperable to those who have not tried.

Hotels passed out instruction sheets to guests and explained how they should act when the sirens sounded. (Park cars in garage, keep off streets.)

Taxis in the test area not previously engaged were to move out with the traffic, picking up pedestrians without charge and dropping them off immediately beyond the boundaries of the test area.

Professional men, doctors, and dentists cooperated by not making appointments or by sending waiting patients home.

Stores released all employees except some cashiers and watchmen; offices discharged their staffs; water traffic which required the opening of bridges was prohibited.

The test unquestionably interrupted business and certain income was irretrievably lost, but Portland seemed to take the view that it was worth the cost.

5. Political

Thirty-four minutes after the warning siren Mayor Peterson with a pleased look on his face called civil-defense headquarters and hoarsely instructed them to terminate the test at 4 o'clock. He looked pleased because he had staked considerable political prestige on the ability of his city government to carry out an elaborate and expensive test and he had won. The fact that he was right should not detract from the political risk that he took, for a failure and a critical press could have made the test look like an expensive and useless boondoggle.

Governor Patterson "had some misgivings because the public might have refused to cooperate completely" but "when the people came out of the buildings and started to walk across the bridge in the pouring rain I was so proud I could have busted my buttons. I hope the word of our success filters down, or up, to Washington."

As Admiral Barbey, Washington State civil-defense director, said, "While others talked about evacuation tests, these men went ahead and tried one."

6. Public

"All persons within the designated test area at the time of the test will be expected to participate in the evacuation unless hospitalized, infirm, or engaged in the conduct of essential public services."

At this writing there is still no tabulation of how many people did partcipate in the test but it undoubtedly exceeded 100,000. The exact date and time of the test was not announced to prevent artificial thinning of the downtown population before the test, however it was agreed that there were fewer people than normal on the streets. This may have been due to good guesswork by the public (the first of 3 possible days was the most logical) or it may have been the effect of a day of rain following a sunny spell.

At any rate, those people who were downtown cooperated fully. As Colonel Sheets, Oregon State civil-defense director, said, "We know now how people will react to a civil-defense test. They want to understand and they will cooperate when they know what to do."

Except for one religious group which opposed the test because of its warlike implication the public seemed to be solidly behind the concept of a test.

Schools participated fully but did not evacuate as groups. Grades 1–4 were dismissed early; older children were sent home when the evacuation signal sounded so that they could evacuate with their families. Teachers took over the safety patrol job at crosswalks because "Kiddies might incur hazardous relationships with vehicles" (understatement of the week).

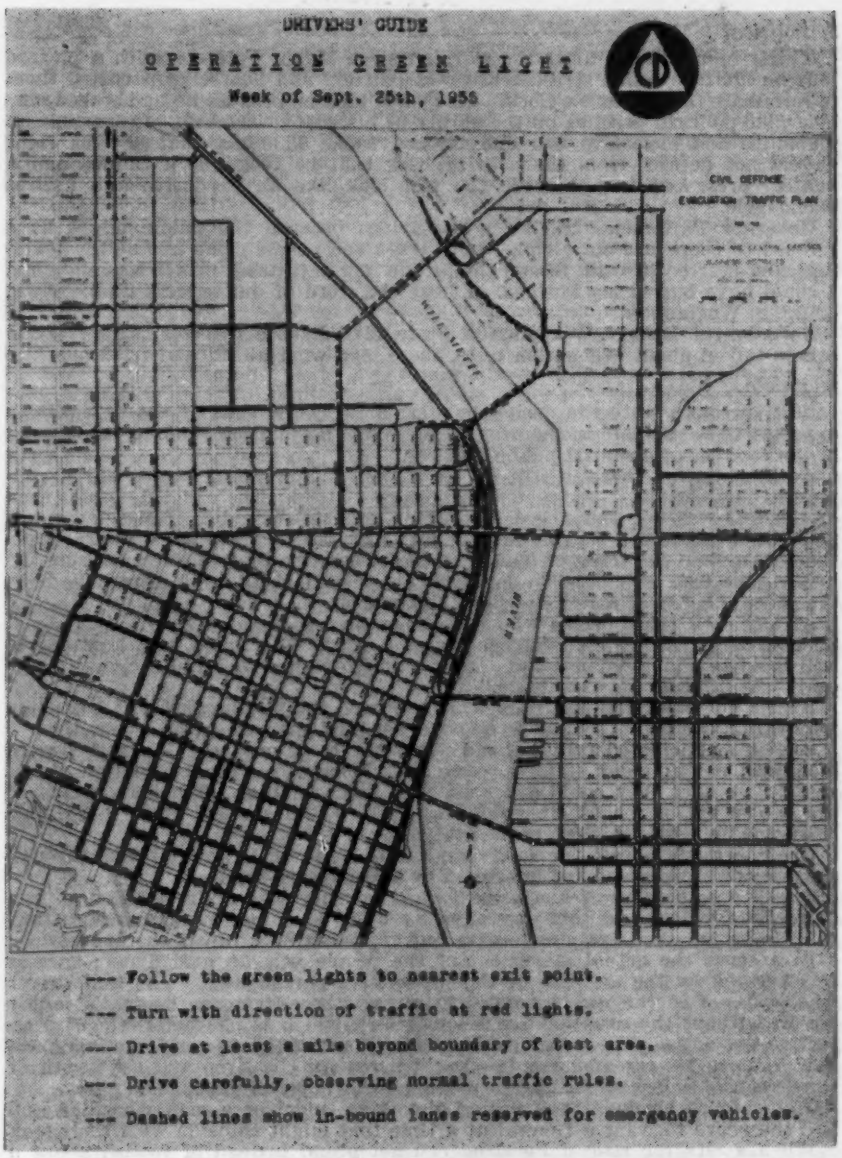
One apartment house evacuated en masse to Newberg, Oreg., and went through the motions of being fed and quartered by that support area.

The key employees of one large Federal agency met their families at predetermined points and then moved many miles to a new position where they were to set up shop again and carry out administrative functions remotely.

In a sense the actual movement of the people was an anticlimax; success was assured by the attitude of the prospective participants. The taxi driver who spoke of it (he was reminded by a news broadcast on the taxi's radio) did so without the usual self-conscious smirk which is characteristic of prospective evacuees. The hotel clerk carefully explained to an incoming guest how to store his car and why he should listen for the siren and get in out of the street. "Unless you'd like to participate" (hopefully spoken).

Civil-defense headquarters seemed almost resentful of a man who died and had the nerve to want a funeral at a time that might coincide with their test.

When a city the size of Portland can act proud instead of foolish about a test of emergency capability, civil defense is coming of age.


DRIVERS' GUIDE
OPERATION GREEN LIGHT
Week of Sept. 25th, 1958
CIVIL DEFENSE
EVACUATION TRAFFIC PLAN
--- Follow the green lights to nearest exit point.
--- Turn with direction of traffic at red lights.
--- Drive at least a mile beyond boundary of test area.
--- Drive carefully, observing normal traffic rules.
--- Dashed lines show in-bound lanes reserved for emergency vehicles.

THE TRAFFIC SYSTEM

Nearly all streets in downtown Portland are one-way; turns with the traffic on red are allowed after a full stop. As a means of directing evacuation traffic without using scarce and sometimes unreliable manpower, the traffic signal system (there is a light on nearly every corner) was wired so that by closing a single switch all signals would go to a fixed evacuation pattern.

This pattern has green lights on main exit routes, red lights to prevent crossing the routes (but cars can turn and go with the evacuation traffic), with amber lights flashing in all four directions. Pedestrian lights were turned off. (The amber flashing constitutes a visual addition to the siren warning system.) The addition of this evacuation direction capability to the regular traffic signal

system cost the city of Portland $28,000 and it appears to have been worth it. Although FCDA rejected the application for the use of matching funds for this signal modification on the grounds that it was impractical, it might well reconsider.

The adaption of a recognized control system for us in a crisis seems likely to have a better chance of being obeyed than some arrangement which people do not recognize.

Other advantages are: (1) System is in effect simultaneously with the sirens and thus requires no special movement of people to direct traffic. (2) Numerous unsightly and expensive signs indicating evacuation routes are not required in the city center. (3) The system can be tested, and altered if necessary, in the early hours of the morning without disturbance of the population.

Traffic on the five bridges was arranged to expedite the movement from the business district on the west side of the river to the residential area to the east. On each bridge a lane was kept open for westbound emergency traffic. As it turned out the load on the bridges was unequal. Steel Bridge carried less than half its capacity but Broadway Bridge, a few blocks away, was crowded and traffic moved slowly (5 to 10 miles per hour) for the first 30 minutes. A bad wreck at the east end of the Burnside Bridge just immediately prior to the test stopped traffic, but somehow it was cleared away in a few minutes and traffic moved rapidly from then on at perhaps two-thirds of capacity.

There was some worry that walkers on the bridge sidewalks would step off into the path of traffic but no accidents of that nature were reported. Two "rear ender" collisions of autos occurred on the Broadway Bridge.

Traffic did not move without presenting problems. During the first few minutes cars went through red lights (slowly) in violation of the rules. Pedestrians, possibly motorists headed for their cars, crossed evacuation routes in large groups and stopped traffic temporarily but without substantially delaying its movement.

There was comparatively little "pickup" of pedestrians. Cars averaged three occupants so ample additional space was available but was not offered. Use of buses and taxis appeared to be at a minimum.

PLANNING

The test succeeded because it followed a carefully thought out operations plan which described the required activities in meticulous detail. The plan was believable and as such it was accepted by the mayor and the press and transmitted to the people. Its preparation (kept quite separate from the actual emergency plan) required 90 days which Director Lowe says is "just about right." The planning and selling took that long but a longer period would have allowed interest to slacken.

Nine civil-defense organizations (cities and counties in Oregon and Washington) worked together on the plan but the bulk of the work was done by municipal bureaus of the city of Portland—coordinated by the civil-defense office.

As the plans progressed, memorandums were developed and circulated on the subjects of purpose and scope, traffic control, transportation, observation and evaluation procedures, public safety measures, and operations instructions.

A closer look at one of the detailed sections gives an idea of the depth of the planning. For the "operation and maintenance of sirens" the following instructions were issued (greatly abbreviated here):

1. No announcement of the time of the test is to be made in advance.
2. Regular weekly test of sirens is canceled to avoid confusion but sirens are to be inspected, serviced, and refueled on September 26.
3. A special test signal (not the real signal) is to be used.
4. Sirens will be operated manually at central control panel to start test and automatically to finish test.
5. Siren operations for the test will be ordered by a CD staff member by telephone who will give his name and the code authentication.
6. In event of actual alert, alarm office is to follow SOP.
7. All sirens will be refueled and inspected immediately following the evacuation test signal and maintenance personnel will be stationed at all sirens until completion of test.
8. Maintenance personnel are to arrive at siren stations an hour before the test (confidential information), examine engines without starting, then make sure controls are set on remote and report state of readiness by telephone to the superintendent who will file a consolidated report to CD operations officer.

9. "At test time minus 5 minutes all personnel will be in attendance at the individual manual control boxes with the exception of the American Bank Building where the attendant will not remain on the penthouse roof, but will take up position on the roof proper adjacent to the access stairway. If a siren fails to start at test time on remote control and other units are still in operation, controls should be immediately switched to manual and the attendant should sound the remaining portion of the evacuation test signal. (See operations instructions No. 1 attached, for special signals.) If manual operation of the bank building siren is required, the attendant will make sure that his ears are protected against sound injury.

In the event a siren cannot be started manually while other sirens are still in operation, no attempt will be made to sound the evacuation test signal with the exception of the downtown unit on the American Bank Building. Every effort will be made at this latter location to sound the "starting" signal even though all other units have completed their operation. The operation of the bank building's siren is of extreme importance, as it is the only siren within the test area."[1]

Other parts of the plan such as those on traffic (maps and instructions to police) and observation (containing many long forms) are even more detailed and could usefully be studied by other cities faced with a similar problem.

It was suggested that an actual evacuation would be easier to run than a test because of the substantial problems of protecting the deserted city, of interesting the people in the test and on working with the news mediums. (The latter item represented nearly half of the effort.)

In the days and hours immediately before the test the phone at civil-defense headquarters rang incessantly—and this was regarded as a good sign. Although the plan had been told and retold in the newspapers, everybody had a question. "My wife is a week overdue with a baby, how will I get her to the hospital during the evacuation?" "How should I prepare for the test?" "What do people in motels do?", etc.

It soon turned out that each caller really knew the answer to his "question" and only wanted confirmation and a pat on the head. After talking about his problem for a while he would pause; if no comment was received from civil defense he would continue. Eventually when the caller had solved his own problem he would thank CD for the help and hang up.

Moral: With a plan to go on, the public can figure out a lot of details for itself if given the opportunity.

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[1] Incidentally, all sirens operated perfectly in all respects

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